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The Outlook

Killing the Goose

IT becomes more and more obvious as time goes on that the high charges both for landing and hangarage at State-owned airfields are quietly destroying the future of private aircraft ownership and amateur flying. If the Ministry of Civil Aviation had reasons for wishing to crush all such flying, or at least to prevent it from being anything more than a means of transport for the rich man or the business executive, it could hardly have evolved a better method. Yet the Government has repeatedly expressed its wish to offer air travel to the masses rather than to the few, and we cannot believe that this landing fee situation is anything more than an administrative "accident." In other words, when the charges were decided upon, the department concerned was thinking only of charter and executive travel and had forgotten the more impecunious amateur.

The landing fees, in particular, are grossly extortionate in proportion to the facilities offered—which are often almost non-existent. To find oneself forced to pay 17s 6d (to quote an average figure) for a refuelling or other temporary stop, and then to discover that one has to fetch one's own chocks and start one's own engine is nothing if not irritating. Yet the case of the private owner who is forced by circumstances to keep his aircraft at a State airfield is likely to be even more financially disturbing, since he cannot take his machine out for a few practice circuits without being faced with a quite unreasonable bill. We have heard of one owner who bought an aircraft before completing his training and is now faced with the prospect of paying 17s 6d for every one of the score of landings still likely to be necessary. Meanwhile, his aircraft languishes in a hangar at the cost of 8s a night. Possibly if this owner had attacked the problem in the right way he might, we feel, as a local club member, have found means of avoiding the payment, since clubs have already been given special consideration.

The Government's answer to all this will no doubt be that if a person can afford to own and fly an aircraft he can also afford to pay a very considerable sum annually in other directions. But this is certainly not necessarily so, and a comparison might be drawn with the case of the yacht-owner whose "light" harbourage dues are of a quite nominal nature. Yet such craft can hardly be considered as being more than sporting devices, and serve no very practical purpose, while aircraft can, at least during the summer months, be used for serious travel.

It cannot be too late to make at least certain amendments to the changes in the special cases of club members and non-business owners of aircraft.

Too Many Accidents

ALTHOUGH, interestingly enough, the Press have endeavoured to convince the public that the recent crop of transport accidents cannot be taken as an indication of the relative danger of air travel, we must, in all honesty, admit that the series have been extremely disquieting. Since the reasons for many of these accidents are still doubtful, it would be rash to attempt to draw direct conclusions from the individual cases. But there appears to have been a more or less equal proportion of mechanical failures and navigational difficulties.

It has always been obvious that aircraft engines must suffer their least reliable moments when being run for brief periods at take-off boost—and these periods are, unfortunately enough, the very ones during which the aircraft are least controllable. It is clear, too, that present radio navigational aids, both in the air and on the ground, are by no means perfect and are liable to be seriously influenced by local conditions.

Drawing the only possible lessons from the recent spate of accidents, we are driven to repeat, once again, a demand for safety at almost any cost. When there is any doubt, services must be cancelled, and if the

technicians feel that aircraft engines are being over-stressed in take-off conditions, then the accepted load maxima must be reduced. The loss of prestige in a service cancellation is infinitely less than that occasioned by any serious accident, and a slight loss of payload is a small price to pay for increased take-off safety. If air transport is to retain, and even increase, its present popularity, the overall safety standards, in comparison with other means of transport, must be high.

The Price of Progress

ONCE again we have to mourn the passing of a gallant man who gave his life in the cause of aviation. The progress of flying has only been achieved by such sacrifices. In the earliest days, the pioneers had little or no factual information to guide them, and it was by trial and error that they gradually had to find their way.

Aviation has come a long way since that time, and instead of the designer being his own test pilot as well as constructor, the flight trials of a new type are now the responsibility of highly specialized test pilots. Many have given their lives in the course of their duties, and it is fitting that on the sad occasion of the death of Geoffrey de Havilland a tribute should be paid also to those other test pilots who have sacrificed themselves in order that we might have better and better aircraft. The value of a good test pilot, although fully appreciated by the designers and technicians, is not understood by the general public, who are apt to think of him, if they consider him at all, as a dare-devil young man who takes his life in his hands every time he takes an aircraft up.

Nothing could, of course, be farther from the truth. That a test pilot must have courage goes without saying. But physical courage is no rare thing, as our young men proved so abundantly during the war. Skill is required, too, but mere piloting skill is not in itself sufficient. The test pilot must be something of a technician, and when an unpleasant characteristic develops in a new type, he must be able to make a pretty shrewd estimate as to its probable cause. His task is rendered more difficult in modern times by the number of instruments he has to watch, and the many readings he has to take. The high speeds attained shortens the time available for making notes. Fortunately the camera has been introduced to relieve the pilot of some of these worries, and in the case of the D.H.108 the films may help to solve the mystery of the breaking-up of the machine.

We are now in much the same position as were the pioneers. Where they lacked reliable knowledge of the aerodynamics of flying problems, we now are groping our way into the unknown regions of sonic flight. Theory can predict something, but the final proof must be provided by the test pilots, at least until such time as it becomes possible to try-out new types by controlling them from the ground. Thus our test pilots are pioneers just as truly as were the early experimenters, although in a different and much more dangerous way. Do not, therefore, let us forget how much we owe them.

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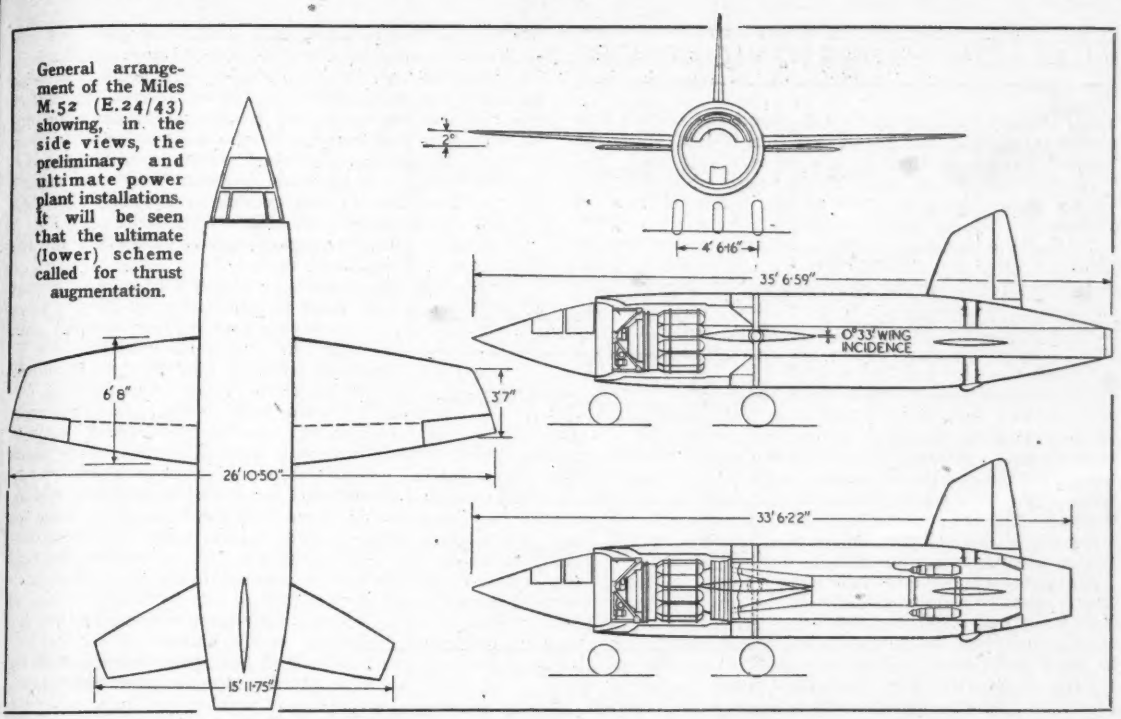
STRAIGHT-THROUGH JOB: The Republic (P-84) Thunderjet fighter with which the Americans are trying to beat the world's air speed record of 616 m.p.h. set up by the Gloster Meteor. It is powered by an axial-flow General Electric gas turbine. The maximum thrust of this unit has not yet been stated. Another picture will be found on p. 363.



General arrangement of the Miles M.52 (E.24/43) showing, in the side views, the preliminary and ultimate power plant installations. It will be seen that the ultimate (lower) scheme called for thrust augmentation.

Miles on Supersonic Flight

Background of M.52 Development : Design Problems Analysed

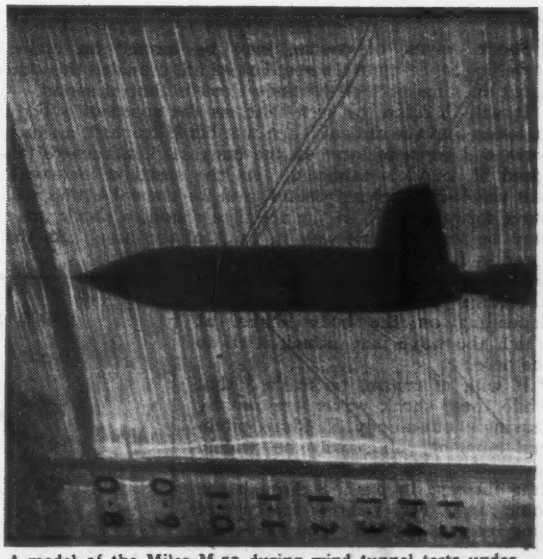
ESSENTIAL features of the Miles M.52, or E.24/43, supersonic research aircraft were described in *Flight* of September 12th. To supplement this information Miles Aircraft, Ltd., have prepared a Paper outlining the research undertaken before the design of the M.52 was crystallized and setting out the problems associated with flight at supersonic speeds. The gist of the Paper is given below.

Towards the end of 1937, runs the Paper, statements were made before a learned society that there appeared to be no reasonable hope of building a useful aircraft for work beyond the speed at which compressibility stall occurred. Apparently this was the general opinion of the meeting at that time, as only Sqn. Ldr. Whittle registered a protest against this attitude to the future possibilities of high-speed flight. Some six years later, however, Miles Aircraft, Ltd. were actively engaged on the design and construction of a machine that was not only to fly in this "impregnable" region, but which, the designers had every hope and confidence, would fly right through the "barrier" and achieve 1,000 m.p.h. in level flight, this speed being approximately twice that considered possible a few years before. Surveying briefly the general problems encountered the Paper states:

Compressibility

At low speeds it may be assumed that air is incompressible and the density everywhere in the field is the same, but as is well known with high-speed aircraft, this assumption causes large errors, and allowances for compressibility effects must be made, and, of course, the closer the speed of the aircraft to the local speed of sound, the greater are these effects. The speed of sound in the air is proportionate to the temperature only, the density and pressure having no direct effect. The velocity of sound decreases with height up to the tropopause, and remains materially constant above this height in sympathy with the temperature.

If we consider a body moving through air at speeds considerably less than that of sound, a flow pattern is obtained in which the air is deflected some distance in front of the



A model of the Miles M.52 during wind tunnel tests under conditions corresponding to 900 m.p.h. Shock waves are clearly visible.

MILES ON SUPERSONIC FLIGHT

body, thereby enabling it to flow round the section in a smooth manner. The reason for this is that the body "warns" the oncoming air that it is approaching, this "warning" itself travelling at the speed of sound, and the air is therefore gradually deflected before meeting the obstacle.

On the other hand, when the body attains speeds greater than that of sound, the flow pattern cannot extend great distances in front of the body because by the time any disturbance has spread to a great distance from the body, it must necessarily have become a small one, and will therefore be propagated at the speed of sound, so that the body itself will tend to overtake any disturbance produced by it. The body, therefore, comes up suddenly against a wall of air through which it has to force its way. This forcing of the body through this "unwarned" air causes very large drags and very serious aerodynamic problems.

The disturbance due to the body must extend to a finite distance in front of it (although this distance may be extremely small) and must be propagated into still air with a speed greater than that of sound. This disturbance is called a shock wave, and its shadow may be seen in front of any body moving faster than the local speed of sound.

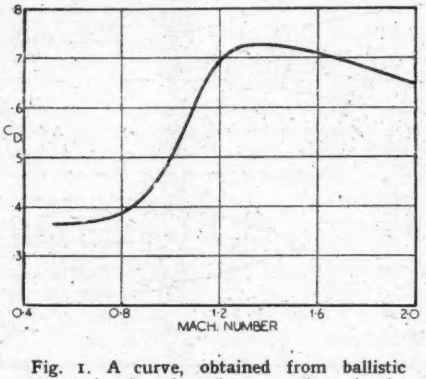


Fig. 1. A curve, obtained from ballistic data, showing drag increase through the sonic range.

A shock wave is a line of small but finite thickness, the velocity of the air which is downstream always being less than the velocity which is upstream of the wave front. The density, therefore, always increases on passing through the discontinuous sheet. Inside this narrow region, which normally is less than 1/10,000th of an inch, the density and pressure undergo abrupt changes, and part of the kinetic energy of the air is dissipated and converted into heat. Along with this development of shock wave, an aerofoil experiences a rapid rise in drag coefficient, and at the same, or somewhat higher, speeds, there is also a fall in lift coefficient and change in pitching moment.

Shock Waves

Shock waves, of course, may be formed on bodies travelling at less than the speed of sound, provided the local speed on some part of the body exceeds that of sound.

It will therefore be seen that, as the speed of a body increases and the critical Mach number is reached, a shock wave will begin to form on the body at points where the speed of sound is achieved. As the speed is increased, this wave will become greater, and for normal bodies will move forward until, at the speed of sound, a shock wave may be formed some way in front of the nose. As the speed is further increased, this shock wave will come closer to the body until a certain Mach number is reached, depending on the body shape, at which the wave may attach itself to the nose.

It will, of course, be realized that while these shock waves are rapidly moving about a body, the drag, pitching moment, etc., will be widely fluctuating. To give some idea of the drag increase in passing through the sonic range, Fig. 1 shows the type of drag increase realized. This curve was obtained from ballistic information.

The drag of orthodox wings increases very rapidly at high Mach numbers, but the actual Mach number at which this increase can be expected depends very greatly on the thickness/chord ratio of the aerofoil and the profile chosen. The so-called high-speed sections were considered suitable for high-speed flight inasmuch as they delayed the critical Mach number for certain wing thickness by having a profile shape to give as small an increase in velocity for a given C_L as possible. However, it has recently been discovered that, although these sections delay the critical Mach number, having once exceeded this speed, they then become inferior to the more orthodox sections. Fig. 2 indicates the difference in drag between a Spitfire and the M.52 up to speeds of 1,000 m.p.h.

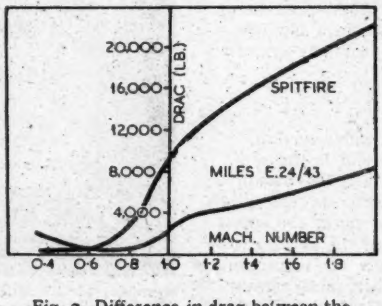


Fig. 2. Difference in drag between the M.52 and a Spitfire at speeds up to 1,000 m.p.h.

Information from Germany has indicated that very great advances in critical Mach number are possible for wings having large degrees of sweepback. [*The theory was stated by Mr. E. F. Relf in his Wright Memorial Lecture, Recent Aerodynamic Developments.*—ED.] However, while theoretically it has been easy to write down that the critical Mach number is increased approximately as $\cos^2$ of the angle of sweepback, in actual fact allowances must be made for end effects, etc. Moreover, it is not easy to design a practical aircraft having angles of sweepback of the order of 65 deg or 70 deg, as the low-speed problems become extremely difficult.

It will therefore be seen that, for aircraft normally operating up to a Mach number of, say, 0.7, the orthodox wing sections are satisfactory. For aircraft normally operating between M=0.7 and 0.8, the so-called high-speed sections may be used. For Mach numbers of 0.8 to 0.95, swept-back wings can most probably be used without unduly serious low-speed problems arising from the sweep-back necessary. But for speeds above M=0.95 it would appear that, with our present knowledge, it is not practical to try to delay the onset of shock waves, but rather to minimise their effect by using long pointed bodies and very thin pointed wings. Although shock waves are formed on these bodies, the drag-increase is not excessive, and there is no limit to the further increase of speed up to a Mach number of 1.5 or 2. It should be noted that, at this high Mach number, a new barrier is reached, as the temperature of a body increases considerably when moving at this speed.

When dealing purely with the supersonic range, preliminary aerodynamic calculations become much more straightforward, as most problems are soluble mathematically and, for preliminary analysis, very simple theories may be used; for example, Ackeret's wing theory has been borne out in practice.

Another important effect of supersonic flow is that the normal induced drag associated with aspect ratio does not apply under these conditions. When travelling supersonically, the aspect ratio of the wing has practically no effect on the drag. This means that if one were designing a machine for supersonic flight, a wing of very small aspect ratio would be desirable, but when considering a practical aircraft which has to take-off in the normal manner and climb to a reasonable height, the low-speed problems dictate the minimum acceptable aspect ratio.

The only portion of a wing travelling supersonically that could possibly have any "induced drag" is that included by the shock waves from the tip making the Mach angle to the wind. If, therefore, this is cut off the wing tips, no supersonic induced drag could be produced (Fig. 3).

As it was very desirable from the

practical aspect to have as much aileron as possible, supersonic wind tunnel tests have been carried out in this country from which it has been found that cutting off the wing tip at the same angle, but making the trailing edge longer than the leading edge, has very little effect on the drag.

A photograph shows a model of the M.52 undergoing wind tunnel tests under conditions corresponding to 900 m.p.h. The shock wave from the leading and trailing edges of the wing and tail unit may be clearly seen. The nose bow wave is also clearly visible.

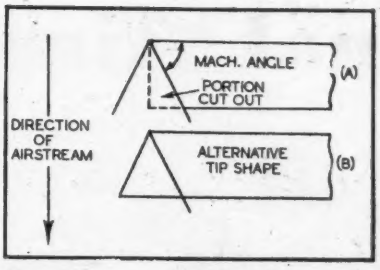


Fig. 3. Showing how the wing tip of the M.52 was to be cut to avoid supersonic induced drag.

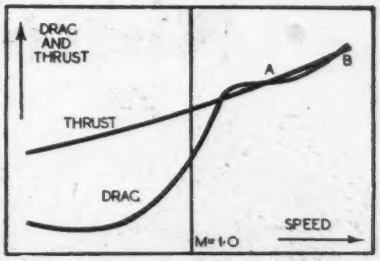


Fig. 4. Illustrating how thrust increases with speed, even under supersonic conditions.

To test the low-speed characteristics of a wing of this type Miles Aircraft, Ltd., constructed a special set of thin bi-convex wings, having the correct wing-tip shape, to enable practical full-scale tests to be made on a Falcon fitted with such unorthodox surfaces. Flight tests on this machine proved reasonably satisfactory low-speed characteristics and showed that aileron control was available even below the stall. To indicate this aileron effectiveness, and also to determine the minimum aileron angles necessary on the supersonic aircraft, a special aileron device was fitted. With this in operation it was found that the machine could be taken off, flown and landed, with very small control movements. The importance of good low-speed stability and control can hardly be over-emphasized for such a small, heavily laden machine as the M.52, which would have a landing speed of 170 m.p.h.

Thrust and Speed

Having considered the problem of reducing the drag to a minimum, it is interesting to note that it is only the advent of the jet engine or rocket propulsion which has made the idea of supersonic flight a practical proposition. With a normal airscrew-driven machine, the thrust falls off with speed, while drag increases. This means that the maximum speed obtainable is reached when the thrust equals the drag, and as compressibility seriously affects the efficiency of an airscrew, it will be seen that this combination is obviously unsuited for such a project. If the jet engine is considered, it will be seen that the thrust increases with speed, even under supersonic conditions (see Fig. 4). This enables a satisfactory aircraft to be made for these high speeds.

Another interesting point arises, however, since the drag of an aircraft increases rapidly at a Mach number of 1, and, a little above this, the increase in drag with speed is less than the increase in thrust with speed. This may quite easily cause an unstable condition, i.e., if an aircraft is travelling at constant throttle in level flight below point A, it will tend to reduce speed, while if it is flying just above A at the same throttle setting, it will tend to increase speed until point B is reached. It will therefore be seen that, to fly in the range A-B, a new type of instability will be encountered.

Besides the problem of supplying satisfactory low-speed characteristics, certain other difficulties arise in the high-speed range. For instance, an all-moving tailplane may be most desirable as, under certain conditions, the normal trailing-edge type of control ceases to function satisfactorily, whereas it is reasonable to assume that an all-moving control will be satisfactory at any speed. On this basis an all-moving tailplane was fitted both to the experimental Falcon and to the M.52. This, together with the fact that normal aerodynamic balancing of the other controls could not be used (again due to compressibility effects) necessitated the use of power-operated controls. The expected control loads on the M.52 were approximately 100 times greater than those experienced on even the largest of present-day aircraft.

Recent information received from Germany has shown some of the preliminary work that has been carried on in that country on the design of supersonic projects, and from this preliminary information and theoretical studies the layout of the future commercial supersonic aircraft is visualized. It is generally agreed that ultimately this machine will normally have small triangular wings having an aspect ratio of the order of 1, and will most probably be tailless.

However, it is considered by Miles Aircraft, Ltd., that while work on this type of machine at the present moment should serve a very useful purpose in time to come, there are so many unknown and added practical difficulties that it will require several years of intensive study and research to bring a machine of this type to a stage where it would be safe for a pilot to attempt to pass through the sonic barrier. However, the Americans, as usual, have had a much larger sum of money to spend on basic and *ad hoc* research, and they already have satisfactory radio control with which it may be possible to carry out the first tests on this type of machine. Even with this equipment, however, it will most probably be several years before a successful man-carrying aircraft can be produced.

R.Ae.S. BIRMINGHAM DINNER-DANCE

REFERENCE to his aeronautical experiences and impressions during a recent visit to Russia was made by Mr. J. Silverman, M.P., when he proposed the toast of the Royal Aeronautical Society at the second annual dinner-dance of the Society's Birmingham branch. The Russians, he said, were utilising all kinds of airfields and to considerable extent, and both Russia and America, encouraged by their vast areas, seemed to be forging ahead with plans for better types of aircraft for the use of the mass of the people. British designers should think in terms of Europe rather than purely national air services.

Mr. R. H. Bound, replying to the toast, instanced the immense progress made by Britain's aircraft designers and constructors, who, he felt, were not lagging behind those of America or the Soviet Union.

Prof. L. Aitchison, proposing the visitors' toast, welcomed the Deputy Mayor of Birmingham (Ald. W. T. Wiggins-Davies), who said that the branch's already healthy membership could be further increased by an offer of block membership to scientific youth organizations and local A.T.C. units.

The function was attended by 150 members and friends.

FORTHCOMING EVENTS

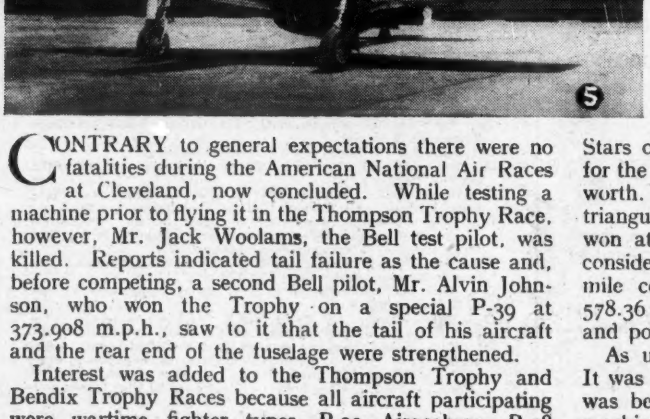
Oct. 3rd.—R.Ae.S. Graduate and Student Section: London: discussion on wing design (part 1), 7.30 p.m.
Oct. 4th.—Reunion dinner, H.Q. 214 Group, R.A.F., Holborn Restaurant, 6.15 p.m.
Oct. 8th.—R.Ae.S. Belfast branch: general meeting.
Oct. 9th.—Gloucester Flying Club, first anniversary dinner and Social evening, Mercer's Hall.
Oct. 9th.—R.Ae.S.: "A Critical Review of German Research on High-speed Airflow." Mr. R. Smelt: Inst. of Civil Engineers, 6 p.m.
Oct. 12th.—Helicopter Association of Great Britain: "Historical Review of Helicopter Development," Group Capt. R. N. Liptrot: Manson House, 26 Portland Place, London, W.1.
Oct. 15th.—R.Ae.S. Graduate and Student Section: London: discussion on wing design (part 2), 7.30 p.m.
Oct. 22nd.—R.Ae.S. Belfast branch: "Flying Experiences," Capt. R. C. Parker, B.O.A.C.
Oct. 25th.—Reunion, 121 Wing, R.A.F. (details and tickets from F. B. Berry, 11 Bush Hill Road, London, N.21).
Oct. 30th.—R.Ae.S. London: Application of the Wind Tunnel to Aircraft Design," Mr. E. J. Richards (Vickers-Armstrongs, Weybridge).
Nov. 2nd.—Reunion 205 Group, R.A.F., in London (details later).
Nov. 6th.—R.Ae.S. Reading branch: film loaned by High Duty Alloys Ltd.
Nov. 7th.—Helicopter Association of Great Britain: "Helicopter Research and Development," Mr. C. G. Pullin: Manson House 26, Portland Place, London, W.1.

National Air Races

Fast Flying by Ex-Service Aircraft : The Rapid-Rolling Lightning

Typical of the P-38 Lightnings in the Bendix Race was that shown at (1). A long-range tank is visible. (2) is Mr. Tucker's Kingcobra (P-63), likewise with extra tanks. (3) A Douglas Invader was entered by Caribbean Air Transport Inc.

The U.S.A.A.F. Shooting Star (4) has a "PR" nose and auxiliary tanks. (5) The Bendix Trophy winner—Paul Mantz's (P51). Other Mustangs were of later marks.



CONTRARY to general expectations there were no fatalities during the American National Air Races at Cleveland, now concluded. While testing a machine prior to flying it in the Thompson Trophy Race, however, Mr. Jack Woolams, the Bell test pilot, was killed. Reports indicated tail failure as the cause and, before competing, a second Bell pilot, Mr. Alvin Johnson, who won the Trophy on a special P-39 at 373.908 m.p.h., saw to it that the tail of his aircraft and the rear end of the fuselage were strengthened.

Interest was added to the Thompson Trophy and Bendix Trophy Races because all aircraft participating were wartime fighter types—P-39 Airacobras, P-38 Lightnings and P-51 Mustangs. An onlooker writes that "the winning of a prize became a matter of what you could smooth out and take off the airframe, and how much you could increase the horse-power. These factors, coupled with piloting skill of a high order, gave the answers, and the progress of aviation benefited but little."

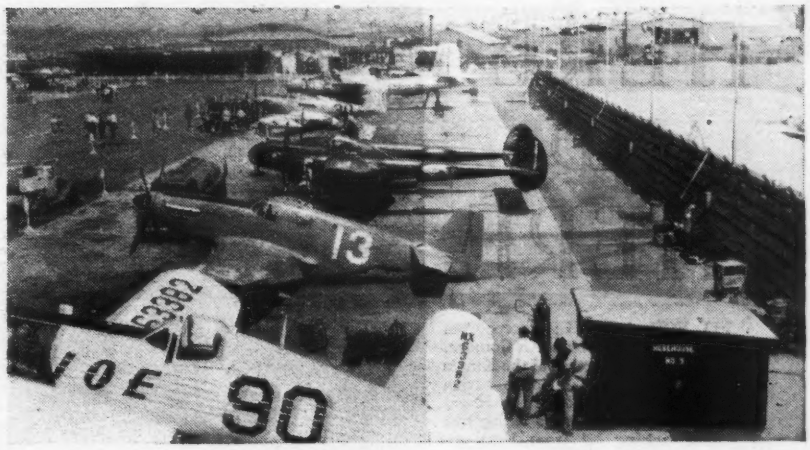
So far as jet aircraft were concerned, the inclusion of a pylon race for P-80 Shooting Stars of the U.S. Army, and a straight speed contest for the same type of aircraft, gave the public its money's worth. The speed contest, which was over a closed triangular 30-mile course (total distance 180 miles) was won at 515.855 m.p.h.—no inconsiderable feat, even considering that the pilots wore G-suits. Over a one-mile course an Army pilot, flying a P-80, clocked 578.36 m.p.h. after a diving start from over 5,000ft. and possibly as high as 10,000ft.

As usual, the aerobatics were good, if frightening. It was difficult to judge whether the high-speed stunting was better than that carried out by the low-powered machines. Perhaps the most terrifying sight of all was the high-speed rolling by a P-38. Executed with great

accuracy at a height of about 500ft and at speeds up to 400 m.p.h., it was certainly an advertisement both for Lockheed's hydraulically-boosted ailerons and for the strength of the aircraft, to say nothing of the pilot. It is almost impossible to judge rate of roll by eye, but this seemed to be about 180 degrees a second. An observer reports that, apart from manœuvres produced by structural failure, it was the fastest intentional change of attitude he has ever seen! (N.B. — "Power-boosted" ailerons are also used on the Shooting Star.)

The same observer goes on to question whether or not aviation received any fillip from the meeting. The local hotels certainly did, for the four-day gathering attracted representatives from the entire American Aircraft Industry, in addition to many thousands of the sporting public.

What will be done next year remains to be seen, but it has been suggested that to increase interest the Races might be made international in character. Many people would like to see the main contest limited to certain engine displacements, in order to encourage the building of special aircraft. It is pointed out that in wartime speed is attained mainly from power.



An imposing line-up of fast, long-range aircraft. Nearest the camera is a Corsair and behind it a Mustang, Lightning, Kingcobra and Invader.

Fokker Redivivus

First Post-war Aircraft from Dutch Constructor : Pusher Four-seater for Private Owner

IT is perhaps significant that the first aircraft produced by N.V. Nederlandsche Vliegtuingenfabriek Fokker, of Amsterdam, since the 1939-40 period, should be somewhat similar in general layout to the G 1 fighter which made its first appearance at the Paris show in 1936, and was in production immediately prior to the war. This aircraft, the F.25 or Promotor, is a four-seater pusher type, with a tricycle undercarriage, the tail being carried on twin booms. It is primarily of wood construction with a two-spar ply-covered cantilever wing, and a nacelle of mixed construction, but the booms and fins are of alloy.

Apart from the tolerably unconventional nature of the general layout, the details of the F.25 are comparatively normal, though the cabin arrangement has been planned in acceptance of the probability that the aircraft will normally be flown by a professional pilot and of the realization that side-by-side seating can reduce useful view. In this cabin the pilot is seated alone on an adjustable chair on the port side, while the three passengers sit behind on a full-width car-type seat, under which the luggage is stowed. There is a single large jettisonable door on the starboard side, with a double entry step which is folded inboard as the door is closed.

The tricycle undercarriage is hydraulically retractable, the main legs moving laterally inwards into the wing and the steerable nosewheel forward into the nacelle. Hydraulic brakes are used and operated by means of the familiar American-type toe pedals.

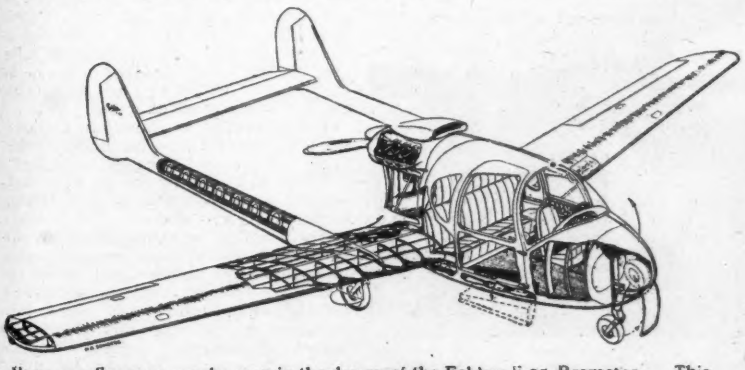
FOKKER F.25
190 h.p. LYCOMING O-435A

Span	39.3ft.
Length	27.8ft.
Wing Area	188 sq. ft.
Wing Loading	15,9 lb./sq.ft.
Weight empty (with normal equipment and radio allowance)	2,032 lb.
Pilot, three passengers, luggage, fuel and oil	948 lb.
All-up weight	2,980 lb.
Maximum speed (sea level)	135 m.p.h.
Cruising speed (3,300ft.)	121 m.p.h.
Landing speed	56 m.p.h.
Rate of climb (sea level)	550 ft./min.
Take-off distance (runway)	250 yards
Range with full tanks	530 miles

No particular power unit has been standardized but any type of suitable air-cooled engine of 165-225 h.p.—such as the Continental E.185 and the Lycoming o-435A—can be fitted. The airscrew is a two-position type of variable pitch. Fuel is carried in a tank lying between the spars in the centre-section, and this has a normal capacity of 44 gallons.

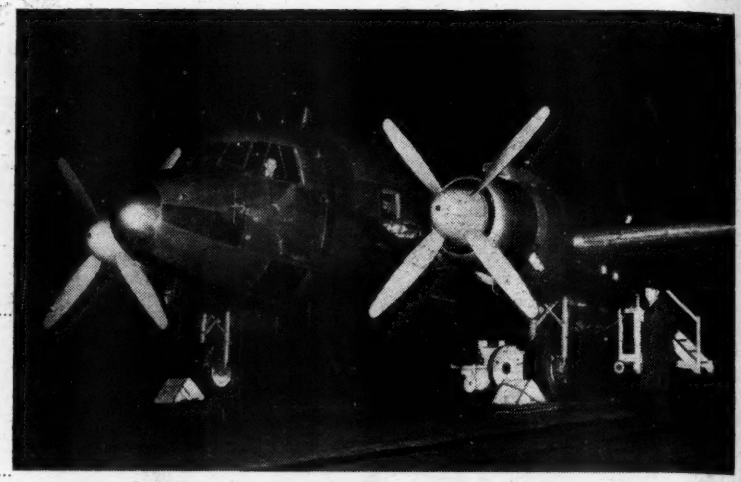
In standard form the F.25 is very fully equipped not only with free-gyro instruments and a sensitive altimeter, but also with a starter-generator—to which power can be supplied by an outside accumulator—while all the necessary night-flying lights are fitted and allowance has been made for the installation of radio equipment.

The prototype of the F.25 is now nearing completion, and series production of a hundred will be under way as soon as the initial test flights have been completed. These hundred are, incidentally, to the order of Frits Diepen Vliegtuigen N.V., The Hague, Holland, who have the world selling rights for all Fokker civil aircraft up to a certain size.



Various influences may be seen in the design of the Fokker F.25 Promotor. This drawing shows the general layou and, in particular, the way in which the occupants are placed.

HERE AND THERE



FIT FOR A KING: As reported on this page last week, Air Comdre. E. H. Fielden, Captain of the King's Flight, has gone to South Africa on a proving flight for the Royal tour. Here is the King's Viking just before taking off from Northolt

Record Breaker in Plastics

A FINE plastic model of the Gloster Meteor is illustrated in the September issue of *British Plastics*. It forms one of the exhibits in the "Britain Can Make It" exhibition.

Tributes from Greece

KING GEORGE OF THE HELLENES has conferred the Grand Cross of the Order of George I on Marshals of the R.A.F. Lord Portal and Lord Tedder, and the Grand Cross of the Order of the Phœnix on Air Marshal Sir A. Coningham, while Air Vice-Marshal W. Elliot is appointed a Knight Commander of the Order of the Phœnix.

The "Ten-Forty"

AFTER last Thursday's issue of *Flight* had left the presses (and therefore far too late to correct earlier information) a statement was put out by the Ministry of Supply to the effect that although the de Havilland 108 had been formally entered for an attempt on the existing air speed record and would be flown at Tangmere by Geoffrey de Havilland, it had been decided not to enter the Supermarine E.10/40 "at present."

The official reason given for this decision was that the Vickers aircraft "is still under development and its full capabilities are not yet known."

A Plastics Map for the Blind

ACCORDING to an article in the September issue of our associated journal, *British Plastics*, a Winnipeg man may have revolutionized map reading for sightless persons. He is Mr. George S. McPhee, a grain cleaner, who recently completed a physical map of Europe in plastics.

Lakes and rivers are grooved and mountain ranges built up, all to scale. Even ocean depths and places of historical interest are included. Specially constructed ridges and pin points have been built so that the reader, with the aid of a Braille slide-rule, may work out distances. The map took 450 hours to make and is 40in by 50in.

Mr. S. J. Evans, Superintendent of the Central Western Division of the Canadian Institute of the Blind, says that the map will become part of the library facilities for the blind in Winnipeg after it has been displayed in other large centres.

Impressive Performance

CHANCE presented the Bristol Wayfarer on its demonstration tour of Canada with an opportunity to prove its capabilities in striking fashion to the Canadian Army authorities.

The Army was carrying out manœuvres in the immediate vicinity and two of their transport gliders taking part in the exercises had to land some little distance from their "advanced airfield."

The Wayfarer, therefore, promptly hopped over to the scene of the emergency landing, collected two jeeps, a five-pounder gun and six paratroopers, ferried them to where they were required and unloaded the lot in 2½ min.

This so impressed the Dominion Brass Hats that they asked for a special demonstration which kept the Wayfarer busy for a whole week.

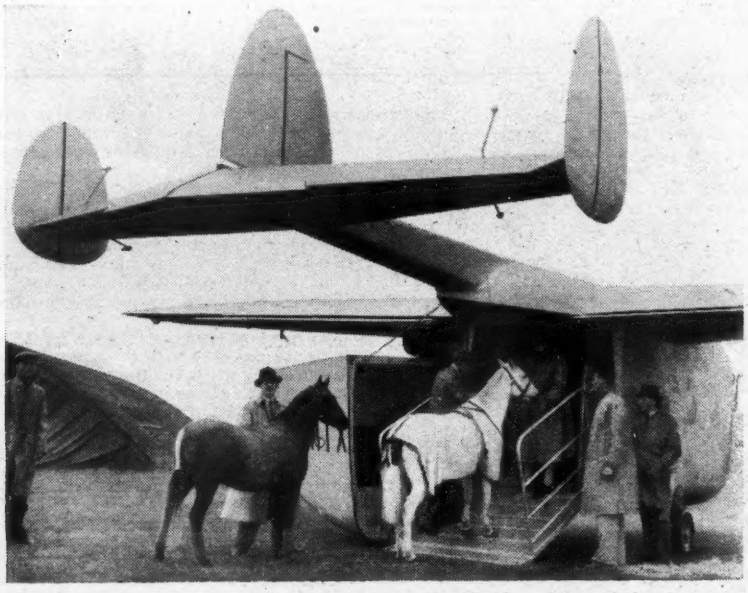
Needless to add, the request was fulfilled with enthusiasm.

Dominion Dogfight

LABOUR strikes in Britain may rob us temporarily of such amenities as gas and milk, but they have not yet gone to the picturesque extreme witnessed in Canada recently when opposing sides used aircraft which indulged in the perilous game of trying to force each other away from the scene of action.

This happened at Hamilton, Ontario, when a Cessna Crane belonging to the Steel Company of Canada "attacked" a Cessna 140 hired by the striking steelworkers to drop leaflets to non-striking employees in the works.

The "union" Cessna, flown by an ex-Atlantic Ferry pilot, was scattering its leaflets from about 1,000ft when the "enemy" took off from the company's landing strip nearby and went into action to try to stop this attempt to seduce the faithful garrison—workers who were actually besieged by union pickets outside the plant, and were living there and being provisioned from the



FLYING HORSE-BOX: Valuable show ponies are now being carried by a transport firm using Miles Aerovans (see "News in Brief") equipped with specially designed horse-boxes. Loading is obviously no trouble at all.

HERE AND THERE

air by the firm's Cessna, flown by an ex-R.C.A.F. pilot.

The resulting "dogfight" went on for about half an hour, and it is recorded that although the attacker had the faster aircraft, the ex-ferry pilot refused to be scared off his course and "completed his mission."

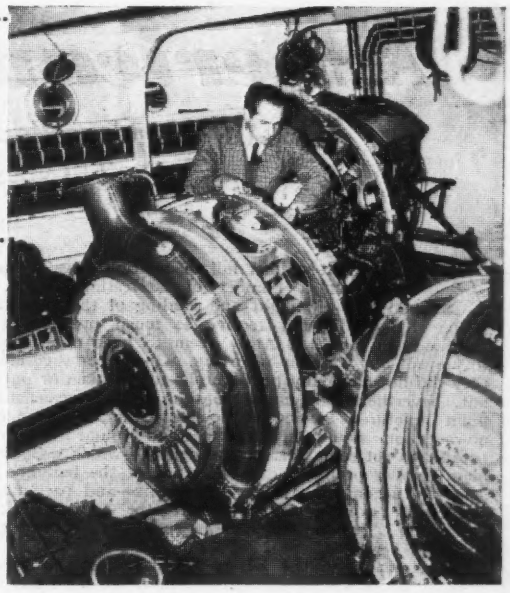
No doubt the two pilots thoroughly enjoyed the fun; the watching crowd certainly did, especially as the proceedings were further enlivened by two newspaper planes dodging in and out to get pictures!

Some Tyre Facts

ALTHOUGH it may shock the womenfolk to hear it, nylon is being used (to a limited extent at present) instead of cotton in the manufacture of aircraft tyres because it is so very much stronger.

Rayon—not quite so dear to the feminine heart and more plentiful—is rapidly supplanting cotton in tyres for the same reason, though it is not so good as the precious nylon.

Four 1,700 h.p. Hercules aircraft engines are fitted in the 105ft Air/Sea Rescue boat designed by Mr. Fred Cooper and built at Ferry Wharf, Isleworth. Rotol reversible propellers are used, eliminating gearboxes. Top speed is 38 knots.



These facts are among a wealth of information contained in the *Dunlop Aviation Year-Book*, 1946, which also says that the use of natural rubber for covers is increasing, though most of them are still being made of synthetic rubber. All tubes are of "natural."

It also discloses that recent experiments have shown pressures up to 90lb/sq. in to be quite satisfactory on "well-prepared runways."

News in Brief

SHOW ponies up to just over 13 hands are being successfully transported by Air Contractors, Ltd., in their Aerovans. Two ponies are carried in a "flying horsebox," specially designed and built by Vincents, of Reading, which fits the internal dimensions of the Aerovan.

(*Picture on p. 360.*)

Mr. T. Blomberg, de Havilland representative for Scandinavia, at Hatfield on his recent visit. He reports that the Vampires are doing well in the Swedish Air Force and that Goblins are being installed in twin-boom fighters of Swedish design.

A weather forecast for sailplane pilots at 8.25 a.m. has been included in the Air Ministry forecasts since September 15th. It is based on readings at Larkhill and Leuchars.

* * *

A window display demonstrating the tour of the Americas by a Bristol Wayfarer, now under way, is staged at Aviation Corner, the Piccadilly showrooms of the Bristol Aeroplane Co., Ltd., at the corner of Dover Street. The tour was organized and managed for the manufacturers by Airwork, Ltd.

* * *

A new office, housed in a modern building in the heart of Singapore, has been opened recently by K.L.M. in readiness for the early resumption of the normal Far Eastern service.

* * *

A correspondent to a daily newspaper recently maintained that the wild weather we are having this year is all caused by "the amount of wireless now on the air." It's That Man Again!

* * *

Another writer says that the many wartime developments in the use of electricity will ultimately redound to the happiness of the housewife—Ohm Sweet Ohm!

* * *

Mr. Norman Anderson, until recently assistant chief designer of the Rotol auxiliaries division, has joined Sir George Godfrey & Partners, Ltd., as chief designer. Mr. Anderson specializes in air conditioning and cabin supercharging.

* * *

Crewless Flying Fortresses, radio controlled from other aircraft, are to be used to test the latest type of *flak* on large bomber formations, according to a message from Washington. The test will be carried out near Fort Bliss, Texas, in December, and the effects photographed from various angles.

Exhibition space at America's first National Aircraft Show to be staged at Cleveland from November 15th-24th will be allocated by drawing lots. A second National Aircraft Show is to be held at Los Angeles next April.

* * *

The first production model of one of Britain's fastest standard motor cycles, the 110 m.p.h. Vincent-H.R.D. "Rapide," has been flown out to Buenos Aires by British South American Airways, to be shown at the first post-war Aeronautical Exhibition there.

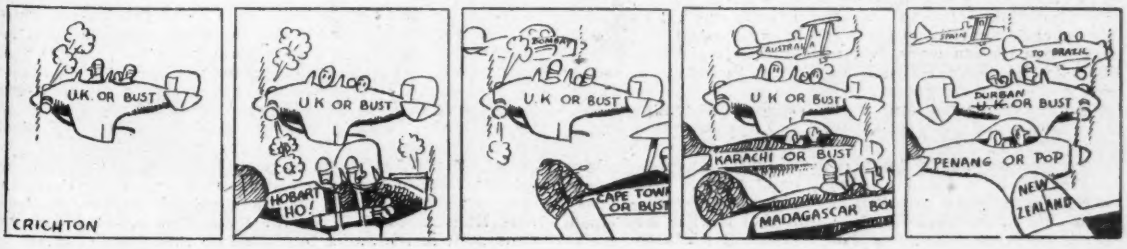
* * *

The Grenadier Guards' Dance Band will provide the music at the dance for past and present students of the Colleges of Automobile and Aeronautical Engineering in the South Hall Suite, Victoria House, Bloomsbury Square, W.C.1, on October 16th. Tickets from the secretary, College House, 72, Prince's Way, Wimbledon Park, S.W.19.

* * *

A comprehensive range of aircraft equipment, including cooking and other galley appliances, ventilating fans, a complete steward's call-sign system, lighting fittings, and everything else designed to give the airline passenger first-class hotel amenities, are described in a new booklet (Aero 9987) published by the G.E.C. and available on request from the publicity department at Magnet House, Kingsway, W.C.2.

AIRSTRIP . . . . No. 33



American Newsletter

The 110-ton Consolidated : Record Attempts : New Civil Types : The Fire Hazard

By "KIBITZER"

AFTER a mid-summer lull in aviation news, there have since been a number of interesting flights. The first take-off, flight and landing of the Consolidated-Vultee XB-36 did not receive as much publicity as was expected; in fact, the Army seem to have done their best to prevent any extreme reporting. One paper suggested that they did not want any photographs to be taken or published, but, nevertheless, managed to reproduce an excellent "in-flight" picture In view of the size of the aircraft concerned, however, one would only need to stand around Fort Worth to be able to get some sort of photograph—which was what the photographer probably did. In view of the ballyhoo which generally accompanies such first flights—and particularly as this is the world's largest aircraft—the Army's attitude is interesting. But the fact remains that this 250,000lb aircraft flew, and flew well.

The Northrop tailless XB-35 has also been doing its flight trials at Muroc Lake. Here again, these are reported as being very successful—which forms a tribute to the careful research work which went into the development of this machine.

As previously suggested in this Newsletter, and now reported officially by the Air Corps, the Bell supersonic machine has more or less finished its "dry" tests, which consisted of a number of drops, or releases, from the bomb-bay of a B-29. The next step is to make a power-driven flight, and this was to have been done by the Bell pilot, Jack Woolams, but he was unfortunately killed in unexplained circumstances while flying a hotted-up P.63 which he had entered for the Bendix Trophy Race.

* * *

News of American attempts on the world's speed and distance records is becoming hotter minute by minute. Lockheeds are said to be after both of them. Rumours of a special P-80 with a somewhat different wing section and air entry duct are now current and speeds of 630 m.p.h. are being forecast. This machine may fly in a week or two, and if it is satisfactory no time will be lost in going after the record—particularly as the P-84 Thunderjet is said to have done only some 608 m.p.h. and they know very well that we cannot have suitable weather in England until our next alleged summer.

The American-held long-distance record may also be attacked by Lockheeds. Although everyone thought that the Army would try to improve the existing figure with a B-29 flight, starting in the Pacific, it is now said that Lockheeds are grooming a special Navy Neptune patrol bomber and will make an attempt in the near future. Once more Army-Navy competition may benefit the American aircraft industry as a whole.

* * *

Another flight which created excitement here was that of the prototype Douglas C-74. This machine had successfully completed some overload trials at a figure of over 165,000lb and was actually engaged in tests requiring shallow dives at fairly high speed, with normal maximum permissible load, when it shed both wing tips. It sounds as though this was caused by aileron flutter, but, whatever the primary cause of the failure, the final result was, to say the least of it, spectacular. Apparently the crew, realizing that something still more awkward might occur at any moment, decided to abandon ship, which they did in good order leaving the pilot time for a last look around to make sure nobody was left on board. The aircraft went on by itself and finally finished up through some high tension wires where it burnt up without hurting anybody. When the Grumman Aircraft Company pioneered the breakable wing-tip as a safeguard against the possibility of pulling the whole aircraft to pieces, they could scarcely have visualized its application to a 150,000lb military transport.

Apropos of unorthodox-looking aircraft, anybody might reasonably have taken a second look recently when they saw a Constellation streaking across the American continent with only three engines *in situ*. But that is what they could have seen when a Pan American "Connie," which had made an emergency belly landing in Connecticut, was flown back to California with only three engines and dural fairing in place of the fourth. The Lockheed test pilot who did the flight reported a perfectly satisfactory trip.

* * *

Almost every day one reads of fresh orders for multi-engined transports. The latest records give 1,013 as the figure of multi-engined aircraft on order. Incidentally, and for the special attention of British manufacturers, engine costs in the States work out at rather less than three pounds sterling per horse power, and in the light aircraft market it is largely this low engine cost which enables the manufacturers to sell so cheaply and to give their distributors reasonable discounts.

The fact that Boeing have announced the Stratofreighter, an all-cargo version of the Stratocruiser, is interesting since it indicates that one of the leading manufacturers believes that there is a need for a really big freight-carrying aircraft—which I have always thought would come in the end. The machine will have ventral loading, will be pressurized and will have refrigerating and heating systems, thermostatically controlled in each of its four freight compartments. The payload will be 41,000lb, but no range has been given at this loading.

As for medium transports, Martins say that they will fly their 202 very soon now and the 303 at the end of the year—so that by next summer there should be a lot of new types on the American domestic routes. Not the least interesting and welcome of these will be the Douglas DC-6 trans-Continental sleepers which are to be delivered to American and United Airlines.

* * *

The Constellation accidents have focused everyone's attention on fire prevention. A number of new requirements are likely to be introduced in the States in the near future, covering such points as the fire-proofing of the inside of the baggage compartments, the improvement of fire-fighting installations, the use of shut-off valves for all inflammable fuel or hydraulic lines, and the development of better fire-resistant qualities for all pipes in the engine bays and wheel wells.

Frankly, one feels that such a programme is long overdue. During the war military aircraft with bad fire histories had to be used and machines and crews were lost as a result. In civil flying bad aircraft must never be allowed to operate. During the last year fire has, perhaps, become the biggest hazard we have, and too little has been done about it. We make our engines and aircraft super-reliable, we introduce every form of safety device into the machine, we spend millions on radio and meteorological aids—but we don't seem to have done much about the one thing which is almost certain to kill everybody if it occurs

Fires nearly always start in the engines or engine bays (electrical wiring fires are rare), and one wonders whether it would be possible to use explosive engine bearer bolts, so that the whole engine could be jettisoned if it went up in flames. After all, a machine will fly perfectly well on three engines, and however shocking it might be for the passengers to see their outer starboard engine parting company with the wing, it would be better than being roasted alive either in the air or on the ground.

* * *

The many R.A.F. and R.N. pilots who flew behind Pratt & Whitney Double Wasp engines during the war will be mildly interested to know that this unit has now received its certificate of airworthiness for commercial use. It is, in fact, the first engine to receive an approved type certificate when using water injection for take-off. The civil engines will be known as the "CA" series and will give 2,400 h.p. for take-off, with a maximum cruising power of 1,800 h.p. on 100/130 grade fuel. While on the subject of engines, it is interesting to note that all the reciprocating units in the Cleveland air races were water-cooled. Furthermore, the majority of them were Rolls-Royce. Even the P-80s were powered with jet units built in the States but based on the Whittle patents.

"Commuting" Aircraft

West London Club Stages Business Man's "Radlett" at White Waltham

ORIGINALLY conceived as a serious effort to interest business houses in the practical value of aircraft ownership, last Saturday's display at White Waltham, opened with suitable words by the Minister of Civil Aviation, actually turned out to be one of the outstanding air shows of the year.

Thanks to the extraordinary burst of autumn summer—reminiscent, curiously enough, of that enjoyed at the very first post-war display in the same place a year ago—business and aviation guests turned up in force. There was a vast concourse of light aircraft of all types on the field, and an exciting sprinkling of military types to add a true air display flavour to the afternoon. For those who arrived with serious interest in the possibilities of aircraft use there was plenty to see, as well as a general air information centre organized by the R.Ae.C. The running commentary by Hugh Bergel was informative, not too aggressively continuous, and delivered in an easy me-to-you manner.

The military types were hardly suitable for, to use an American expression, "commuting" purposes, though, as Bill Humble remarked, you could, if you wished, buy a Hawker Fury in your own colour scheme for twenty thousand or so. But this Fury, Beamont's Vampire and Twiss's Firefly, helped to make the afternon, and there was, in fact, *one* "commuting" military type present—Bramson's civil-registered, black-and-cream Spitfire II, which had just been flown over from Marshall's, where it had been prepared for its peaceful last flying days. One wonders how many requests for a circuit, from ex-Spitfire pilots, will be received by the owner. There is certainly one coming from us.

Of the medium civil transports, a Vickers' Viking was flown, almost continuously, in steep turns on one engine—with one of British-American Air Services' Bristol Wayfarers, an Airspeed Consul and a Miles Aerovan. The smaller types were too numerous for individual mention, though the outstanding crazy-flying show by Harald Penrose with a 1929 Westland Widgeon must be recorded. The commentator remarked that this helped to show the progress made during the last ten years or so, but one wonders, really, whether so much progress has been made. The Widgeon flew, in its own way and with its 1930 standard of comfort, just as well as anything else.

To those interested, the outstanding event of the afternoon was the flying appearance of the Chrislea Ace prototype—which seems certainly to have fully recovered from its initial directional troubles now that it is fitted with twin fins and rudders. Since the Ace is still experimental, it could not be landed, but flew back to Heston after making a few circuits in good order. One gathers that, in addition to the redesigned empennage, the production Ace is likely to have rather less dihedral.

Returning, by way of epilogue, to the original purpose of the display—that of interesting the business man—no one needs to have any doubt about the fact that aircraft *are* being used by large numbers of firms. At White Waltham even the initiated must have been surprised by the variety both of types and businesses among the aircraft to be seen in the extensive park, yet those present can only have been an average proportion of the aircraft in use. Very encouraging, indeed, though the situation may be modified when there is no longer any E.P.T. to spend.

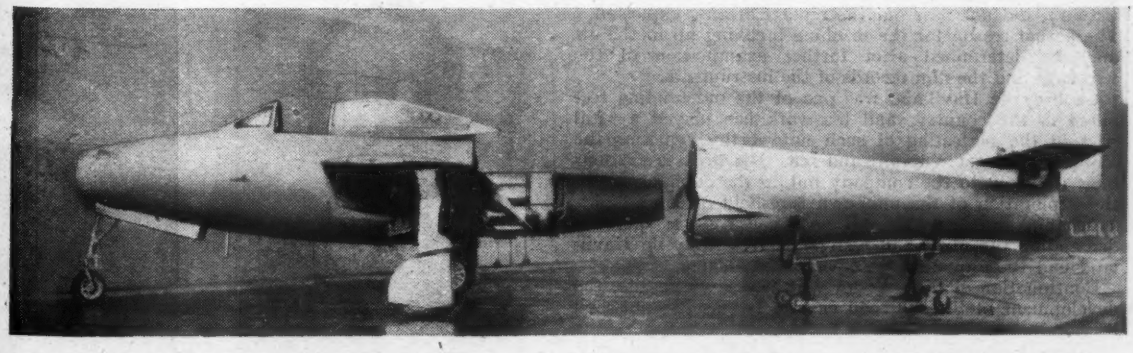
Rolls-Royce/Douglas Demonstrated in U.S.A.

THE Canadian-built "North Star" (Douglas D.C.4M), which is powered with four Rolls-Royce Merlin "620" engines, has recently completed a successful demonstration flight from Montreal to the Douglas plant at Santa Monica, California. The flight was planned as part of T.C.A.'s proving and familiarization trials for this prototype machine. It also provided an opportunity for Douglas engineers and officials to inspect the aircraft and engine installation and on demonstration flights to assess its behaviour and handling characteristics. Benny Howard, vice-president of the Douglas Corporation, piloted the machine at Santa Monica and was very impressed with its performance.

On the outward journey stops were made at Toronto, Fort William, Winnipeg, Lethbridge and Vancouver, to give Trans-Canada Air Lines personnel an opportunity of familiarizing themselves with the machine, as it is the first of a fleet which will shortly come into service on transatlantic and transoceanic air routes.

The Merlins performed excellently throughout the trip and the high standard of performance at altitude was particularly impressive On the coast-to-coast return flight from Vancouver to Montreal the "North Star" was fully loaded with fuel (3,000 galls), making an all-up weight of 73,000 lb. This is the highest all-up weight at which the aircraft has so far been flown. Nevertheless an average speed of 275 m.p.h. was maintained on the last leg of the trip, which is 2,400 miles and roughly the equivalent of an Atlantic crossing. On the whole flight most of the flying was done between 9,000 to 11,000 feet, but between Lethbridge and Vancouver the aircraft was taken to 16,000 feet to clear the Rocky Mountains, which have a maximum height ot 14,000 feet. At this altitude the Merlins were delivering over 1,000 horse-power per engine.

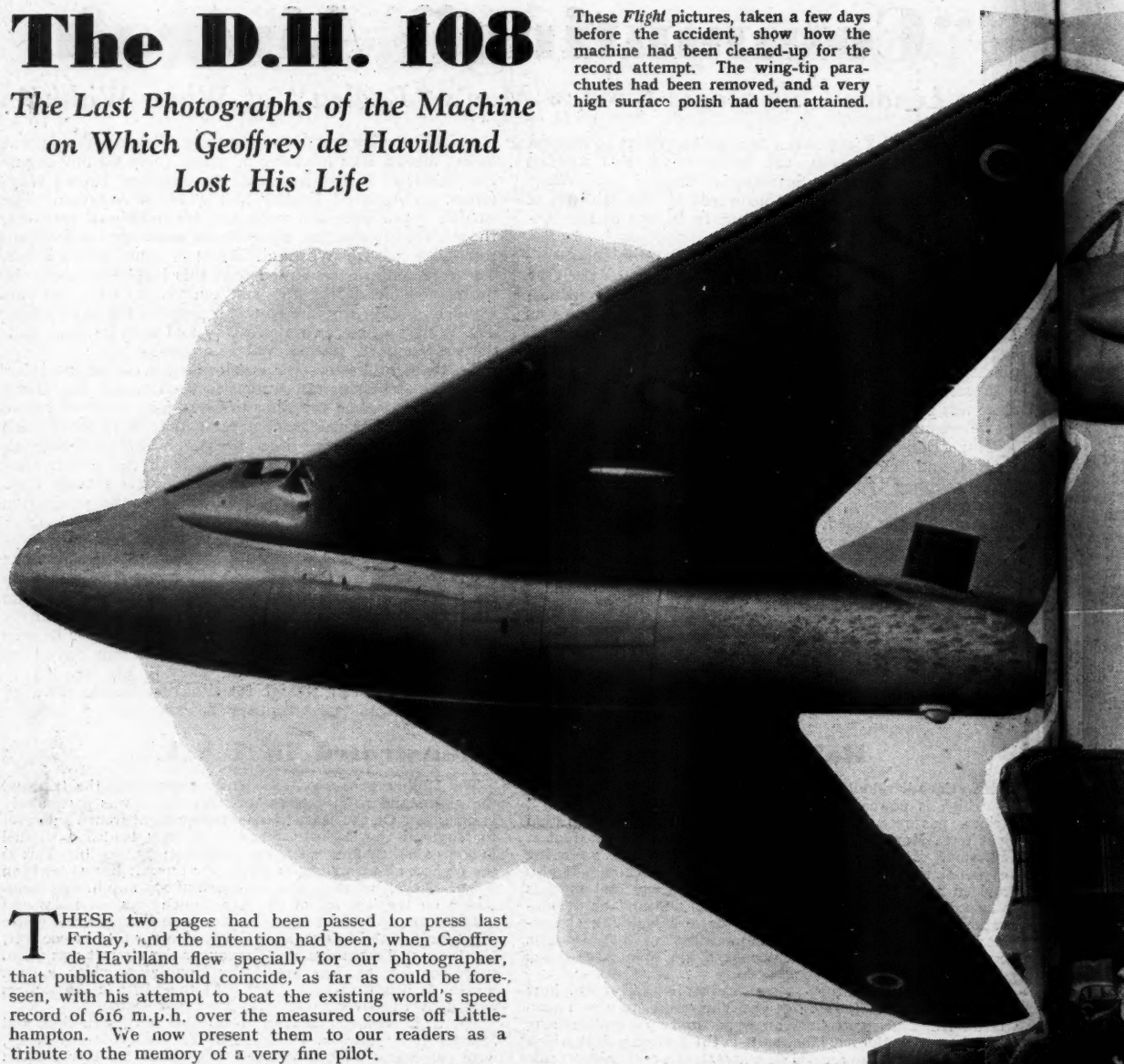
Mr. C. D. Howe, Canadian Minister of Reconstruction, and Mr. H. J. Symington, President of Trans-Canada Air Lines, were passengers for the complete trip, while Sir Roy Dobson flew in the machine from Montreal to Toronto.



DESHABILLE : This new view of the Republic Thunderjet shows how the axial-flow General Electric TG-180 turbine-jet can be exposed, permitting, it is claimed, a change of power plant in 50 minutes.

The D.H. 108

The Last Photographs of the Machine on Which Geoffrey de Havilland Lost His Life



These *Flight* pictures, taken a few days before the accident, show how the machine had been cleaned-up for the record attempt. The wing-tip parachutes had been removed, and a very high surface polish had been attained.

THESE two pages had been passed for press last Friday, and the intention had been, when Geoffrey de Havilland flew specially for our photographer, that publication should coincide, as far as could be foreseen, with his attempt to beat the existing world's speed record of 616 m.p.h. over the measured course off Littlehampton. We now present them to our readers as a tribute to the memory of a very fine pilot.

As we closed for press last Monday, the body of Geoffrey de Havilland had not been found, but the pieces of the 108 retrieved from the mud in Egypt Bay, in the Thames Estuary, did not bear out the reports of an "explosion." The actual reason for the machine breaking up in the air may be determined after further examination of the wreckage and the film records of the instruments.

Geoffrey de Havilland was one of the outstanding test pilots in the country, and his work has played a vital part in the perfecting of such noteworthy types as the Mosquito, Hornet, Vampire and 108. His death is a serious blow not only to the company but to the country, for in the exploration of the unknown threshold of sonic flight, a combination of skill and cool courage are qualities demanding the utmost of test pilots. Geoffrey de Havilland had these qualities in a very high degree.

Continuation of the task for which he gave his life, the development of the 108, will ensure that he has not died in vain.

To his wife and parents, and to his only surviving brother, Peter de Havilland, *Flight* extends its sincerest sympathy.

Geoffrey Raoul de Havilland.

TG306

Danish Week-end

Successful "Flying Day" Rally at Four Club Centres : Good British Support Despite Initial Bad Weather

THOSE somewhat aeronautically *blasé* air display spectators in this country who feel that their time and travelling have been poorly rewarded if our test pilots do not appear in force with the very latest types might have felt rightly ashamed had they been transported to Denmark during that country's club flying week-end. In four areas the clubs did their successful best to entertain and educate crowds with the very minimum of local material, and those crowds mostly stayed to the very end of a distinctly cool and meteorologically unreliable afternoon.

Local Enthusiasm

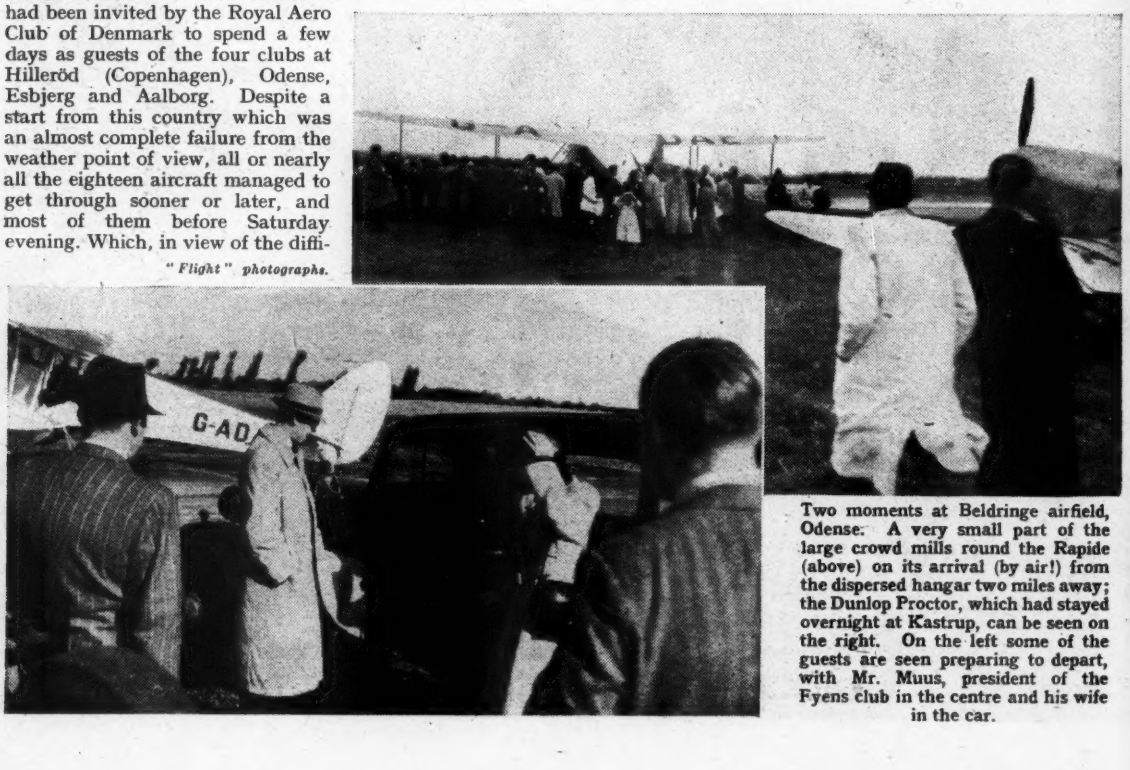
At Odense, for instance, some ten thousand people were happy and more than satisfied to see in the air the Fyens club's Austers and KZ-II, a KZ-III, a primary glider and some very dashing models, with a small British leavening consisting of a Proctor and a Rapide, to add an international tone to the proceedings. Three R.A.F. Mosquitoes were due to arrive over the airfield during a semi-aerobatic tour, but these, apparently, gave their display over the town itself—some six or seven miles away—and passed on. Those of us who had recently spent a day or two at the S.B.A.C. show felt that we would have given several days of our lives if just one modern fighter could have rocketed over the crowd for a couple of minutes. But fortunately the afternoon was a faintly sad one only to the initiated; the bulk of the crowd seemed to be more than happy. In any case, to the visitors the display simply formed the peak of an exceedingly hospitable week-end in Denmark.

For this week-end—of special significance in the quickly revived post-war Danish flying clubs—owners and club members had been invited by the Royal Aero Club of Denmark to spend a few days as guests of the four clubs at Hilleröd (Copenhagen), Odense, Esbjerg and Aalborg. Despite a start from this country which was an almost complete failure from the weather point of view, all or nearly all the eighteen aircraft managed to get through sooner or later, and most of them before Saturday evening. Which, in view of the difficulties and delays of European air travel, was a particularly fine effort. A glance at the weather on Friday, with its very low cloud, heavy rain and gale-force wind, might have been enough to discourage anyone who was not attempting the five hundred-odd-mile flight in something with a really useful range and cruising speed.

Airfield Difficulties

For, east of the Netherlands, the airfield and refuelling situation is nothing if not hazy, and might, for the smaller types, have been impossible without the help and guidance of the fuel organizations, since a non-stop run from, say, Schiphol, Amsterdam, to Esbjerg or Odense is both too long and too watery for little machines. However, Hamburg's Fuhlsbüttel airfield—completely undamaged and looking much as it did in 1939, though populated by the R.A.F.—could be used, and at least one crew managed to wheedle some fuel from the not-too-helpful American occupiers of Bremen. Furthermore, Groningen airfield, near the eastern boundary of the Netherlands, was open, looking bright and new, for use in emergency by those who couldn't make the run between Schiphol and Hamburg. The former, incidentally, provides a lesson for all of us. Despite the fact that little over a year ago the airfield was a bombed-out wreck, this centre of K.L.M. airline operations is quite incredibly busy and efficient, the tarmac crowded with Skymasters, Dakotas and Constellations, and with temporary buildings up, or going up, all over the terminal area.

Unnecessarily fearful of the delays and hazards of such a journey while in charge of some small aircraft, we joined the Rapide party, led by Wing Cdr. O. V. Holmes (who



"Flight" photographs.

Two moments at Beldringe airfield, Odense. A very small part of the large crowd mills round the Rapide (above) on its arrival (by air!) from the dispersed hangar two miles away; the Dunlop Proctor, which had stayed overnight at Kastrup, can be seen on the right. On the left some of the guests are seen preparing to depart, with Mr. Muus, president of the Fyens club in the centre and his wife in the car.

DANISH WEEK-END

was taking a busman's holiday from charter activities with his own Airborne Services) from White Waltham to Odense, whereto we had been invited by the Fyens Flyveklub. By devious and interesting routes suggesting the somewhat special possibilities of charter travelling for those who care to make the most of a freedom of air movement not possible in airline travel—we flew outwards via Lympne, Eindhoven and Hamburg, returning via Groningen, Schiphol and Croydon.

The airfield used by the Fyens Club at Odense is the ex-German Air Force station at Beldringe with an immensely long single runway and dispersal tracks of a length and tortuousness which was almost inconceivable—even by the anti-attack standards in our own country. Both the Rapide and the two Proctors—one brought over by Mr. Lyle from Panshanger, and the other by Mr. Sutcliffe, of Dunlops—had to be taxied something like two and a half miles to the only usable hangar, with the result, in the case of the first Proctor, of temporary tyre trouble. As an indication of the kind of treatment offered to the visitors, a new wheel complete was later lent by the Danish Air Force, flown over from Jutland and fitted by the club. Remembering the prodigious hospitality in Odense and the way in which the party was shepherded day after day by the club's members and their wives, it is difficult to see how the considerable debt can ever properly be repaid. One can only hope that the clubs in this country will do their best.

The Fyens Club members have two Austers, a KZ-II and a primary glider for instructional work, while, on the "day," a third Auster was lent by a private owner. Unlike the III, the KZ-II is a low-wing, tandem-seater type with sliding canopies and "letter-box" slots. Lt. Petersen, the club's C.F.I., showed off its aerobatic possibilities very adequately during the display, after putting up a similar show at another club.

Quite naturally, the largest number of visiting aircraft concentrated near Copenhagen, where the Hilleröd Club were entertaining the party. At Kastrup and, later, at Hilleröd—which, at present, is simply a large field without hangarage—there were six British aircraft in addition to four Danish KZ-IIIs. Biggest of the visitors was Mr. Irvin's Beechcraft, flown by Capt. A. B. H. Youell, which, though it could not land in the club field, was duly demonstrated. At Hilleröd, too, something rather more ambitious in the way of a display was staged, with "dive bombing," a looping Grunau Baby and crazy flying both by a primary glider and a KZ-III. The latter, after jettisoning a dummy pilot, gave all proper indications of being out of control.

Altogether, and in spite of one or two mishaps caused by strong winds or difficult ground conditions, the British visitors certainly had the time of their lives in Denmark. For many of them it was their first visit to the country, and for nearly all of them the first since the war. And, by way of postscript, it may be added that, though motoring fuel is rationed in Denmark, there are no restrictions in the supply of fuel for aircraft—and, apparently, no landing fees worth mentioning.

Spinning Intake

Ingenious Napier Development of Sabre-Tempest Annular Radiator Installation

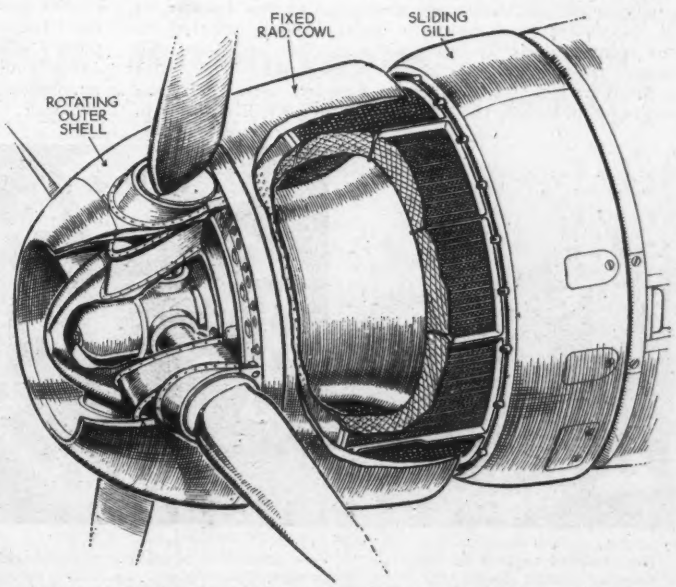
THE association of the radiator with the liquid-cooled engine has ever been a problem confronting designers both of aircraft and their power units. Divorce is impossible—except in freakish circumstances—and so a great deal of thought has been devoted to making the best of the situation; in fact, no small amount of design ingenuity has been expended in the many and varied schemes evolved to mitigate the difficulty.

In our issue of July 25th we published details of the very neat Napier annular radiator installation designed for the Sabre, and whilst not wishing to reiterate too much that appeared then, it may be briefly recalled that the annular radiator scheme, as compared with the orthodox underslung arrangement on Typhoon and Tempest, resulted in an overall radiator drag reduction of 8.8 per cent which, in the Tempest, gave a corresponding increase of speed by 11 to 14 m.p.h.

Further Improvement

Despite this achievement, Napiers continued to look for improvements, and the natural progression from the existing annular radiator arrangement was to fit a ducted spinner. It was realised that the only way in which intake area could be increased without incurring a consonant step-up in cowling diameter, or reduction in spinner size, was to extend forward the leading edge of the cowling approximately to the plane of the spinner nose. This meant that the extension piece would surround the airscrew blade roots and, therefore, must rotate with the spinner.

In collaboration with Constant Speed Airscrews, Ltd., a trial installation was made up and found to substantiate largely the advantages expected of it. Modifications, as always, were necessary; a slightly smaller spinner was

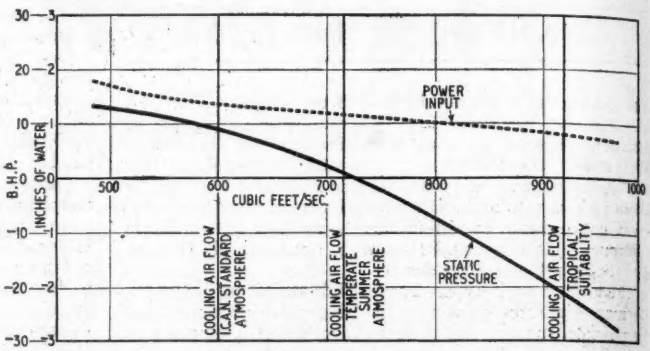


• From this part-sectioned drawing a clear idea of the build-up and operation of the ducted spinner may be gained.

SPINNING INTAKE

tried, but found to be ineffective due to blade root losses, and various shapes of blade root were considered, together with different designs for the cuffs, or spats, which enclose them; finally, a complete design was arrived at which satisfied, broadly, the various requirements.

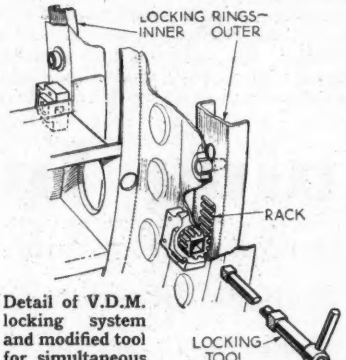
As may be seen from our cut-away drawing and the detail photographs, the Napier-C.S.A. ducted spinner consists of two concentric surfaces, the inner one of which is a conventional spinner housing the airscrew hub in the usual way, whilst the outer surface, providing a central ram-head air intake, is supported by the faired airscrew-blade cuffs which are built on to the normal spinner. Thus the intake form is that of an annular duct split helically into four passages by the blade fairing cuffs. These latter are of aerofoil shape, and their "pitch" setting may be selected during design in order to produce the optimum static head increase for the critical climb or ground-running condition.



Curves of power and pressure against cooling air flow for typical climatic conditions and max. level flight at 26,000ft.—Hawker Tempest VI with Napier Sabre VI.

Construction

The normal spinner backplate has been modified by the addition of a "backplate" ring for the rotating outer surface, and this is carried on four fabricated radial box members, which enclose the rear ends of the airscrew cuffs. An adaptation has also been made to the very neat V.D.M. locking arrangement; the normal locking ring has been retained on the spinner proper, and a further locking ring also provided on the new annular backplate. For the benefit of readers who may be unfamiliar with the V.D.M. locking system, it can briefly be described as consisting of a partially rotatable ring fitted to the rear side of the spinner backplate (which is supported on the airscrew shaft) and pierced by a series of "keyholes." Appropriate waisted pegs mounted on the spinner itself fit into guides on the backplate and engage the "keyholes" in the locking ring. This latter is fitted with a small rack, and a pinion operated by the locking tool causes the ring to rotate a small amount in order to bring the narrow section of the "keyholes" around the waists of the pegs and so lock the spinner to the backplate. In adapting the system to embrace the new ducted spinner, the single locking tool has been retained, but it is fitted with large and small flats; the outer-ring pinion has a square coring so that the tool can pass through it for actuating the inner ring. A glance at the detail sketch will clarify the arrangement.



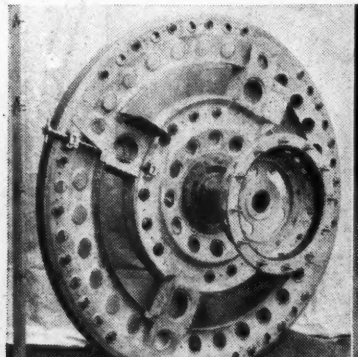
Detail of V.D.M. locking system and modified tool for simultaneous operation of both lock-rings.

Performance

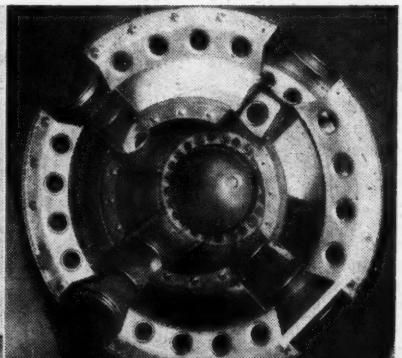
From the functional point of view, the hollow spinner aims to improve conditions of intake flow at both high and low values of V/nD—that is, where V is forward speed, ft/sec; n is airscrew r.p. sec; and D is airscrew diameter, ft. A considerable pressure rise may be made available for ground-running (and climbing-speed flight), and the design can be adjusted in order to give a somewhat smaller pressure rise at high flight speeds.

The leak between the trailing edge of the spinner outer shell and the forward edge of the fixed radiator-shroud cowl absorbs a small amount of drag power which, of course, increases with speed; but the effect is minimised in flight by a certain amount of thrust recovery which is governed by the propulsive efficiency of the leak. In the present Tempest installation a simple 0.5in wide leak aperture is employed, and tunnel tests show that an efficiency of the order of 50 per cent may be expected. As at speeds in the 400 m.p.h. region, the leakage flow may perhaps be as much as a quarter of the total cooling flow, the thrust available from the leak is a valuable positive factor, which becomes enhanced when conditions of flow breakaway on the inner or outer surface of the cowl are retarded or partially suppressed by the energising agency of the leak.

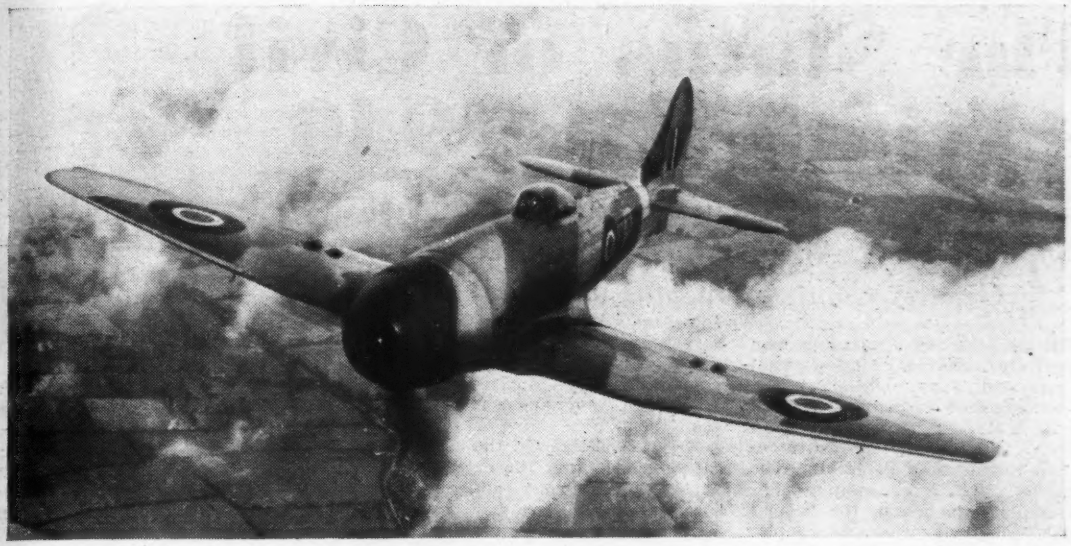
Preliminary research both in this country and in America on various examples of annular entry ducts comprising constant, increasing and decreasing cross-sectional area types, have established the balance of advantage as being with the simple constant-area type. In the constant area, or constant-velocity intake, the pressure rise due to fan action of the faired blade roots is not transformed



The modified spinner backplate showing shaft sleeve, blade-cuff fairing boxes, locking peg guides and the special locking tool.



View from rear of spinner minus backplate. Construction of the blade-root cuffs can be seen together with the V.D.M. locking pegs between the apertures for blade passage in spinner and outer cowl.



The neat line of the rotating cowling and the useful intake area are well shown in this view. The white spot in the intake orifice is a highlight on the spinner proper.

into increased velocity, such as obtains in the case of the constant-pressure (decreasing section) type of entry with its resultant diffusion losses, nor, as in the case of the increasing section duct, is internal flow breakaway so liable to occur with its consequent penalties of pressure drop.

Whilst with high-solidity airscrews absorbing large power outputs a useful pressure rise may be generated by the blade roots, it has been shown that, for 3-blade types, some 24 per cent increase in flow may be induced —during ground running—with a ducted spinner of constant-area type over that possible with the normal arrangement under similar conditions.

It is in this field of single-rotation airscrew power units, and more particularly in conjunction with airscrew-turbine engines, that the ducted spinner can be expected to have a very healthy future before it.

Comparative performance figures for the Napier-C.S.A. ducted spinner and the best representative orthodox radial cowled installation are given below. The drag values are in pounds for 100ft/sec, and the comparative condition is for flight at 430 m.p.h. at 20,000ft (I.C.A.N. Standard), and a cooling flow of 600 cu ft/sec. Cooling air mass flow is taken as being 24.1 lb/sec, and the entry velocity ratio 0.316.

COMPARATIVE PERFORMANCE DATA

	Ducted Spinner.	Typical Orthodox Radial Installation. (Flared 3-blade a/s.)
Entry total head pressure rise—in. water	4.9	3.2
Cooling flow, cu ft/sec.	285.0	230.0
Min. internal drag	3.0	3.0
Entry drag, minus fan thrust effect ...	0.2	1.9
Wake loss drag	0.3	0.8
Thrust loss from fan-effect power input	0.6	—
Leak thrust	−0.1	—
External drag	4.0	4.0
Net cooling drag	8.0	9.7

C.A.S. Visits Bassingbourn

Systems of Controlled Landing for Aircraft in Poor Visibility Demonstrated : P.I.C.A.O. Sidelight

AS a result of an air staff decision the demonstration prepared at R.A.F. Station Bassingbourn for P.I.C.A.O. delegates (as previously reported, some 250 delegates representing 37 countries attended demonstrations at Bassingbourn) was extended in order that R A F. Commands and others might avail themselves of these facilities so excellently arranged by Transport Command.

On Thursday last, September 26th, our representative attended demonstrations given before the Chief of Air Staff, Marshal of the Royal Air Force Lord Tedder, other members of the Air Staff, C. in C.s of R.A.F. operational commands, and some 80 service delegates from R.A.F. commands, Dominion operation staffs, and representatives of Naval Aviation and Marines.

The Chief of Air Staff's party flew from Northolt to Bassingbourn in two aircraft equipped with the most up-to-date radio and radar aids to navigation. The equipment, classed as A or B according to type was demonstrated on the outward and return flights.

The morning's programme consisted of a complete explanation and demonstration of the system suggested by Transport Command for controlling aircraft movements in poor visibility, and in the afternoon a similar demonstration was given using the system proposed by the Ministry of Civil Aviation.

The large, distinguished and representative gathering of serving officers have been asked to "consider the various methods and techniques demonstrated with a view to pooling their reactions to them in the light of their experiences in the particular commands to which they belong." They will give their views at a winding-up conference to be held in London, and in this way the Director-General of Signals, Air Vice-Marshal W. E. Theak, will have the benefit of the considered views of the Commands before he recommends to the Chief of Air Staff a radio and radar aid policy for the Royal Air Force.

Air Marshal the Honourable Sir Ralph Cochran, Commander-in-Chief of Transport Command, addressed those present on the application of the various systems and on the equipment required. The operation of the two systems and the equipment required was described in *Flight* of September 19th, pages 313-315.

The demonstrations were particularly interesting in that the room in which all the equipment was installed was situated on the edge of the airfield in full view of the runway in use. The aircraft under control could therefore be followed visually from the time they approached the airfield until landing. This made a most interesting comparison with positions estimated and plotted from instruments. The aircraft taking part were four Dakotas, one Halifax, and one Mosquito, and the demonstration began with radio contact while some 60 miles away and approaching the area control zone. Both systems worked admirably, and the decision as to which shall finally be employed will be a most difficult one to make.

The Status of Civil Aviation in 1946

Past History of British Contribution : International Complications : Anglo-American Differences : Orderly Competition Still our Ideal

Sir Henry Self, Permanent Secretary to the Ministry of Civil Aviation.

By
Sir Henry Self, K.C.M.G., K.B.E., C.B.

SIR HENRY SELF, speaking as a private individual and without representing any official authority, summarized on September 25th, before the Royal Aeronautical Society in the lecture hall of the Institution of Civil Engineers, a Paper on "The Status of Civil Aviation in 1946." The Paper, which was the Second British Commonwealth and Empire Lecture, formed a synoptic review of aviation since the time when it became apparent that a new form of transport had entered civil life. It is, in consequence, a record of great length. The actual lecture, as delivered, covered only the most important points in the Paper, and it is those which are recorded here.

We find, said Sir Henry, that in the years immediately after the first World War the Government's praiseworthy, but highly premature, dictum that "aviation must fly by itself" had to yield to pressure of circumstances. The few struggling British operators of air services to the near Continent, though successful initially, were forced out of business by the heavily subsidized French company, and there was a short period in 1921 when Croydon Airport was used exclusively by foreign operators. As a partial remedy, a provisional subsidy was introduced which, though trifling in comparison with present-day standards, served to set some of the British companies on their feet again.

In 1922 a new agreement increased the subsidy to £105,000 a year. But this proved inadequate, and a Civil

> *"We are, in fact, in an age when we see the tyranny of the specialist."*

Air Transport Subsidies Committee (better known as the "Hambling Committee") was appointed in 1923 to review subsidy policy. It may be of interest to recall that, in their report, the Committee stated that "the benefit of competition under these (the existing subsidy) schemes was, therefore, illusory, and until Civil Air Transport has become more nearly self-supporting we do not think competition can be relied on unless at an unnecessary cost, to stimulate its development. So far as efficiency of service is concerned, adequate incentive should be provided by the direct competition of foreign companies with large Government resources behind them."

As was well known, the Committee recommended that the existing three subsidized companies, and one other unsubsidized company, should be welded into one organization, strong enough organically and financially to undertake, with some assurance of success, the task of developing our overseas air services. The resulting company—Imperial Airways, Ltd.—was formed on April 1st, 1924, and on that date took over the organization and equipment of its constituent companies. This was the origin of the theory of the single "chosen instrument" for British air services overseas which remained the cardinal principles behind U.K. air transport developments between the two World Wars.

The Empire Air Mail Scheme

It was, he considered, to the credit of the British Post Office that it had always been prepared to entrust mails to a new medium of transport as soon as reliability of carriage had been established. Accordingly, since 1919, mails had formed a part of the payload of a gradually increasing number of regular British air services. In the early years these mails were surcharged in addition to the standard stamp value. In many countries this practice had been continued right up to the present time. Great Britain, however, had seen in the potentialities of air mail traffic an opportunity to foster its overseas air transport and commerce within the Empire. By 1934 it was realized that it would ultimately be more economical, and a greater incentive to air development, to carry mails without surcharge. It had been found, also, that the various national Post Offices could calculate the flow of mail traffic with sufficient accuracy to justify long-term contracts. From these facts, and the operating experience gained by Imperial Airways, the Empire Air Mail Scheme had been conceived, and despite the many attendant difficulties, been put into operation with eminent success. By this scheme we had carried by air all letters between the United Kingdom and British Commonwealth countries on the Empire air routes, at the rate of three halfpence per half-ounce.

> *"We must be large minded in civil aviation and cast away the impediments of petty nationalism."*

The essence of the scheme was to give an assured load of mail which would warrant a considerable increase in size of aircraft and frequency of services. The guarantee of all first-class mail ensured mails equal to 45 per cent of new Empire air services with the specially designed Short Empire "C" Class flying boat, on a frequency of:—

(a) Nine per week between U.K. and Egypt,
(b) three per week between U.K. and S. Africa,
(c) five per week between U.K. and India, and,
(d) three per week between U.K. and Australia.

That was a great step forward and it had enabled Imperial Airways to press on with the expansion of their organization, and it had been in fact the basis for getting British civil air transport moving. Some countries, for example, Australia, had found it better in their special circumstances to retain modest postal surcharges; while the great potential of passenger traffic revealed itself as the guarantor of its own services. With such development and the necessary lapse of the "all-up" mail principle during the war years, there was the probability that future schemes for co-ordinated operation of the Empire Air Routes by the Commonwealth operators would be based primarily on the economics of passenger transport, coupled with surcharged mail carriage at rates progressively reduced with advances in operational technique but yet reflecting the extra advantages

THE STATUS OF CIVIL AVIATION IN 1946

given by air carriage over surface transmission. In that direction the future seemed to lie; but the Empire Air Mail Scheme had been a great experiment and a pioneering effort in the development of air transport by bold decisions taken at the peak of opportunity.

Sir Henry thought it was important to recall that within the space of six years two Committees sat under the Chairmanship of Lord Gorell. The first, in 1933, was appointed to consider a number of civil aviation questions concerned chiefly with the control of flying. The most important development arising from the Committee's Report was the establishment of the Air Registration Board, which had done such sterling work in the past 10 years, as evidenced by the growing scope and volume of the duties which had been assigned to it by the Government.

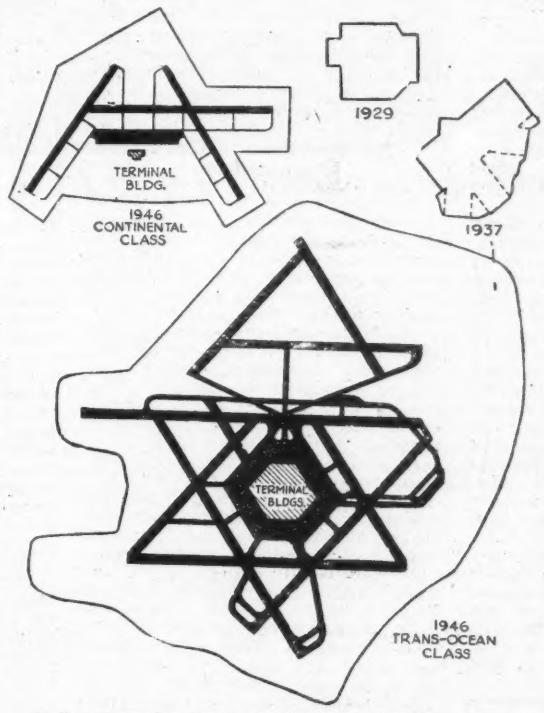
The Civil Aviation Act

In 1920 the Government of the day had held the view that the civil air services must ultimately be self-supporting. That was the view of the Government of to-day, and they would seek by international agreement progressively to eliminate all forms of subsidy. They recognized, however, that if air transport was to fulfil its function of providing services in the public interest, some measure of State aid would perhaps be necessary to support essential but unremunerative services. The Government consider that the policy enshrined in the Act offers the best guarantee to the public of disinterested expansion of the nation's air services with economy and efficiency.

The Act would ensure, also, the implementation of the fundamental principle behind the Government's policy, namely, planned order in the air. For the present, the plan was necessarily a *national* plan, because the nations of the world were not yet ready to place their air services under the control of a single world-wide owning and operating body. The plan had been so framed, however, that it could be readily assimilated into any future scheme of international organization. Arrangements had been made for the fullest co-operation—by means of parallel operations—with the Dominions and Colonies. Our approach was towards internationalism; but it was an approach only to be made in step with our Commonwealth partners and through the development of our common Empire services. These, Sir Henry believed, would demonstrate the needs and possibilities of world air transport in the future.

Trans-Atlantic Agreement

Once again referring to the 1920s and 1930s there had been, he said, many international agreements between individual countries, but these agreements were mostly bilateral, and few were multilateral. It was, therefore, gratifying to record that the machinery of Commonwealth collaboration had played a foremost part in one of the first multilateral agreements to be signed in that period. During the Imperial Economic Conference, held in Ottawa in 1932, a committee was appointed to consider the question of an air mail service across the North Atlantic Ocean. In due course, agreement was reached in Ottawa in November, 1935, that trans-Atlantic survey flights should be made as soon as possible, and that a joint operating company should be formed. An understanding was reached with the United States for reciprocal landing facilities in the territories of the countries concerned.



A diagrammatic comparison of airport dimensions from 1929 to the requirements of the immediate future.

The formation of the joint operating company had been interrupted by the outbreak of war, but the experience gained on the trial flights across the North Atlantic and the comprehensive ground organization which had been planned and instituted for these flights had proved of incalculable value during the war.

It was equally the case that Commonwealth associations in other regions, and particularly in regard to the Empire Air Routes, had provided a demonstration of the possibilities of international co-operation on which the future would turn. Aeronautical matters were, he believed, first discussed between Commonwealth representatives at the Imperial Conference of 1922. The discussions were renewed at the Imperial Conference of 1926.

Commonwealth consultations continued throughout the late war, and, when the time had arrived to consider the shape of the post-war world, one of the first actions was to convene a Commonwealth Conference, in October, 1943, at which principles for greater freedom of the air on a basis to be regulated by an international air authority were agreed. It became clear that the closest agreement existed between the Commonwealth Governments on the general principles which should govern international air transport, though differing opinions were held as to the practical application of those principles.

To plan and advise on the technical organization of the Empire routes, a Commonwealth Air Navigation and Ground Organization Committee (C.A.N.G.O.) had been set up with representatives from the United Kingdom, the Dominions and the Colonies. On the operators' side, a Commonwealth Air Transport Operators' Committee had been established to study the questions of mutual interest and to advise the Commonwealth Governments on practical operating problems.

Anglo-American Differences

Sir Henry Self then stressed that against this background of the future pattern of air transport had been super-imposed the seemingly fundamental difference between the American and British attitudes towards the economic and political control of air services. The Americans favoured world-wide "free-for-all" competition (despite the rigid regulation of their domestic air transport) and the British favoured regulated competition. Overshadowing all was the determination to avoid a return to the wasteful competition and subsidy wars which had darkened the arena in former years.

In such a situation the old Paris and Havana Conventions were totally inadequate. A new Convention, with world-wide application, had become essential. As we had seen, the main defect of the earlier Conventions was their inadequate provision for international regulation in the economic field, since they had dealt principally with technical matters. These were discussed at a number of exploratory talks between those Governments which were specially interested in the development of post-war air transport. The discussions had indicated a substantial measure of agreement on such important subjects as the right of transit and non-traffic stops, the control of rates and competitive practices, the gradual curtailment of subsidies, the need for uniform operating and safety standards, the use of airports and facilities on a non-discriminating basis, and the operation of airports and facilities in certain areas of the world.

With these ideas in mind, the British Government, in October, 1944, published a White Paper setting out a plan

THE STATUS OF CIVIL AVIATION IN 1946

for the ordering of post-war air transport. This plan proposed that there should be a new multilateral Convention, providing for the multilateral grant of four main operating privileges, which had become known as the "first four freedoms of the air." They were:—

1. The privilege to fly across a country's territory without landing.
2. The privilege to land for non-traffic purposes.
3. The privilege to disembark passengers, mail and cargo taken on in the aircraft's home country.
4. The privilege to embark passengers, mail and cargo destined for the aircraft's home country.

The White Paper proposed that the fifth freedom—the privilege to carry traffic between two foreign countries—should continue to be the subject of bilateral negotiation. To eliminate uneconomic competition, it was proposed that international air routes, frequencies and their distribution among the countries concerned, should be determined by an international authority which would be responsible also for fixing fares and rates.

Shortly before the publication of this White Paper, the United States Government had issued an invitation to an International Civil Aviation Conference. This invitation received a very encouraging response, and representatives of fifty-four nations met in Chicago in November, 1944. Even though it had not been possible to obtain complete agreement on measures to ensure the orderly growth of international air transport, the Chicago Conference had accomplished many solid achievements, foremost of which was the establishment of a Provisional International Civil Aviation Organization and the drafting of a new Convention to supersede the Paris and Havana Conventions.

With such a development there was a growing risk that the air transport world would become divided into two opposing camps, and it became more than ever necessary for Britain and America to compose their differences. Accordingly, early this year, delegations from

> *"The most important developments arising from the Gorell Committee's report were the establishment of the A.R.B., ... the transfer of control of civil aviation to Secretary of State for Air . . . . . and compulsory third party insurance."*

the two countries met in Bermuda. By dint of good will and a conciliatory attitude on both sides, a bilateral agreement had been signed providing for the operation of air services between United States and United Kingdom territories.

The difference in outlook reduced broadly to the standpoint of (a) complete freedom for commercial enterprise to develop air transport services relying upon an ultimate balance between supply and demand; as opposed to (b) the urge to safeguard legitimate national interests within a co-ordinated international control whereby the growth of air transport services should be regulated on an ordered basis and made subject to a proper sharing of capacity which would be operated in step with increasing demands. The opposition between the two schools was obvious, especially if the attempt under (b) to establish an ordered pattern could only be carried through by means of determination of capacity to be operated *before the event*. Instead of control before the event, there was stipulated that freedom in development of services should be in accordance with those principles.

Clearance of that situation had opened up the opportunity for exploration among all the nations, through the machinery of P.I.C.A.O., of the possibility of finding a solution to the difficulties which had hitherto stood in the way of a multilateral convention. Such a solution would avoid all the difficulties and embarrassments of the present system of bilateral negotiations between each pair of nations interested in the air routes of the world.

The Problems of Ground Organization

By the summer of 1939 there were 121 licensed civil airports of a permanent nature. The six years of the war witnessed in this country an airfield construction programme whose extensiveness and intensiveness was unlikely to be equalled at any other time in its history. Furthermore, the remarkable advances made during the war in the size and performance of transport aircraft had created ever-increasing demands upon the critical dimensions, zoning of flying approaches and technical equipment of airports.

In 1939 the cost of providing a first-class transport airport of "standard" dimensions varied, according to location, topography and other circumstances, between £300,000 and £450,000. In 1946 the cost of providing a "Continental" Class airport, with a single set of runways, would vary roughly between £750,000 and £1,250,000, while a "Trans-Ocean" one would run into many millions. A corresponding increase had taken place also in the respective maintenance costs, he observed. It had become imperative to ensure that the free and full implementation of the Government's air transport plan would not be stultified by the lack of modern airports, suitably located and adequately equipped and staffed. It was decided, therefore, that the ownership and operation of airports required for scheduled services must be undertaken by the State.

The detailed plan under which the State airports would be organized had not yet been finalized, but present proposals visualized that the United Kingdom would be divided into four Divisions, comprising (1) Scotland, (2) Northern England and Northern Ireland, (3) South and West England, (4) London and East England. The principal object of this Divisional Organization would be to secure local efficiency and co-ordination through decentralization, and to relieve the Ministry of Civil Aviation Headquarters of a volume of day-to-day work which could more effectively be performed with the intimate knowledge of local conditions which would, in time, be acquired by the Divisional staff. Each Division would be in charge of a Divisional Controller, who would be responsible for the efficient operation of all airports and technical services in his territory. He would be assisted by a staff of experts on the various technical services. Each would be controlled by one Airport Commandant.

It would appear, he continued, that, when the present nationalization proposals have been fully implemented, there would be, in all, upwards of one hundred State-owned and operated airfields in the Divisional Organization. The London Airport and other existing State civil airfields would be absorbed into the new Organization.

As an adherent of the Interim and International Air Services Transit Agreements concluded at Chicago, the Government had accepted obligations to provide

> *". . . . . present policy will make it possible . . . . . for the taxpayer to receive some benefit in return for assistance he is required to provide during the initial period of State-aided operation."*

the airports and ancillary facilities required for international air services. Under these Agreements each country reserved to itself the right to nominate the particular airports which were to be opened to international air services, without discrimination as to nationality or to rates charged for landing fees. Such airports, known as "designated" airports, were to be selected with due regard to the route on which the services operated. The airports would be equipped to internationally agreed standards, which were being carefully examined by P.I.C.A.O., with a view no doubt to being prescribed as standards for international observance.

The ground organization requirements of world-wide air transport would undoubtedly create a number of problems for the international legislators. Some of the smaller foreign countries which lie athwart the international trunk air routes might be unable or unwilling to undertake their full responsibilities, as adherents to the Chicago Agreements, for the provision of airports for international air services. P.I.C.A.O. had wisely provided that such countries may apply to P.I.C.A.O. for financial, technical and other assistance in meeting their commitments.

(The remainder of Sir Henry Self's lecture dealing with aircraft production and the human reaction to aviation will be published next week.)

STORMY WEATHER IN U.S.

A Lockheed P.80 Shooting Star broke up in the air near Burlingame, Kansas, on its way from the Cleveland National Air Races to the West Coast. It was one of about twenty aircraft, including a flight of 17 U.S. Army P.80s, which flew into heavy storms in this area on their way home from the air races. Two of them crashed and at least ten others were forced down.

The civilian pilot of a Vultee aircraft was killed, but the Shooting Star's pilot baled out and landed safely.

ANACHRONISM: The first Viking in Norway. A thrice-weekly B.E.A. service is now in operation.

Atlantic Met. Ships : U.S.-U.K. Talks : P.I.C.A.O. Impressions

CIVIL AVIATION NEWS

OCEAN WEATHER STATIONS

THE P.I.C.A.O. Conference dealing with the future use of ocean weather observation stations in the North Atlantic has prepared an international agreement providing for the operation of thirteen such stations. This follows the recommendation made at the P.I.C.A.O. North Atlantic Air Navigation Conference in Dublin earlier this year. Nine States of the North Atlantic region—Belgium, Canada, France, Ireland, the Netherlands, Norway, Sweden, the United Kingdom and the United States—will participate directly or give financial support to the scheme, and the ships will be manned and controlled by the meteorological departments of the countries.

Each of the thirteen main "stations" will be served by special vessels which will make surface meteorological observations at least eight times daily, upper-wind observations not less than four times daily, and upper-air pressures, temperature and humidity observations at least twice daily. The upper-air observations will, of course, be made by radio sonde balloons, the courses of which will be traced by radar methods.

The vessels will form part of a general North Atlantic search and rescue organization for aircraft, and they will also furnish any necessary radio aids and incidental flying control services. The maintenance of such ocean stations is not, of course, a particularly new idea. They were used considerably during the war, but the number has since been drastically reduced. It is hoped that the system will be in full operation by July 1st next year. The placing of the vessels is arranged for the best observation results to suit the airline tracks, while avoiding shipping lanes.

The Conference held its meetings at the Royal Geographical Society in the week following September 17th.

ANGLO-AMERICAN LIAISON

TWO new posts have been created to promote good relationship and understanding between the U.S. and British Governments in the field of civil aviation. The Ministry of Civil Aviation is to have a representative in the American Civil Aeronautics Board in Washington and the C.A.B. is to have a representative in the Ministry of Civil Aviation in London.

Mr. Nigel Bicknell has been appointed to Washington. Better known perhaps as Wing Commander, he had wide experience in the R.A.F. on bomber operations, and after a tour as flying instructor in Canada and the U.S.A., served with Ferry Command and the Empire Flying School. He subsequently commanded a Mosquito Special Duties Flight in the Pathfinder Force, and his last R.A.F. appointment was in command of Cambridge University Air Squadron (1945-46), of which he was a member from 1937 to 1939.

Mr. Vass is the C.A.B. representative and was formerly with the U.S. Security Commission and the Office of Price Administration, after which he joined the U.S Air Transport Command.

BERMUDA SEQUEL

THE visit of United States aviation officials to the exhibition of the Society of British Aircraft Constructors provided the opportunity for informal discussions with Lord Winster and representatives of the Ministry of Civil Aviation, and the Foreign Office.

The developments in the operation of international airlines since agreement was reached in Bermuda on February 11th between the two nations, and the experience gained during tests taken monthly, was the most important matter discussed. The terms of that agreement are thought by both parties to be sound and to provide a reliable basis for the orderly development and expansion of international air transport. Moreover, they believe that those principles provide the basis for a multilateral international agreement of the type that their representatives advocated at the P.I.C.A.O. Assembly in May.

It is therefore a natural consequence that in negotiating any new bilateral agreements with other countries both parties will endeavour to follow the basic principles agreed at Bermuda. These principles refer in particular to fifth-freedom traffic and the establishment of fair and equal opportunity for all in operating air services on international routes. Furthermore, each Government is prepared, upon the request of any other Government with which it has already concluded a bilateral agreement that is not deemed to be in accordance with those principles, to make such adjustments as may be considered necessary.

It is understood that arrangements have been completed for the creation of machinery, outlined in the Bermuda agreement, for continuous consultation and the exchange of views between both countries on all problems in connection with civil aviation.

P.I.C.A.O. DISCUSSIONS

AFTER two weeks' intensive work, the P.I.C.A.O. delegates discussed, on September 24th and 25th, the Radio and Radar equipment they had seen at Farnborough, Malvern and Bassingbourn. The number of delegates and observers had increased and those attending numbered approximately 280—representing more than sixty nations.

Sir Robert Watson Watt, as chairman of the meeting, welcomed the delegates and impressed upon them the necessity for regarding the discussions as informal, and to give free expression of opinion with the utmost frankness, since any withholding of criticism would be doing a disservice to the United Kingdom as the host, and to civil aviation generally. Sir Robert assured everyone that there had been no intention by the British Government of regarding the demonstrations as a commercial drive for the sale of British goods. In fact, he had been authorized to state, as official British

CIVIL AVIATION NEWS

policy, at Montreal, that any system which was accepted as operationally and technically efficient should be produced by any competent organisation in any country without regard to the origin of development of the system or equipment. There was absolutely no question of a British monopoly in any particular navigational aid.

In considering the technical value and efficiency of equipment delegates were to remember that the price to be paid could not be measured only in currency, but by the sacrifices in weight, space and man hours. Sir Robert made the observation, on the subject of servicing, that the daily inspection was probably the greatest enemy to operational efficiency.

Commenting upon the known but unforecastable phenomena which affected radio, Sir Robert said that the effect varied according to the wavelength, but that, in his opinion, despite others to the contrary, the effect was almost negligible at ultra-high frequencies.

The navigational aid system at present in use in Australia was demonstrated by Dr. Burn, and may be briefly described as a combination of a partial Gee system and a Eureka beacon. The Gee system, consisting of only two stations, provides a pattern of hyperbolae for homing. A Eureka beacon, situated between the two Gee stations, allows the distance to be measured. The special equipment for this system is compact and light in weight.

The delegates then asked questions on various items of equipment, and when satisfactory answers were not immediately available arrangements were made for private discussions with either the manufacturers or the United Kingdom representatives. One of the more interesting points was the suggestion, that V.H.F. presented a language difficulty and the question was asked whether impulse signalling could be used for air/ground communication Mr. Larnder, of the U.K., stated that such a system could be produced, but that there was at present no air conversation vocabulary. It was imperative, Mr. Larnder said, that the number of words should be limited, and such a vocabulary would require the co-operation of airline operators and aircrew. He hoped that something would be done to produce such a vocabulary in order that the necessary research could go ahead. The question of whether interpreters should be employed on flying control at international airports would be raised at Montreal.

The delegates generally were highly appreciative of the accuracy and all-round qualities of Gee as a sound means of navigation. The United States representatives were, however, not satisfied that it was the best basis for traffic control, such as in the M.C.A. system. The fact remains, however, that no alternative suggestions were made during the discussions, but some may, of course, be forthcoming after the visit to America.

TYNESIDE AIRFIELD

AFTER an unsuccessful six months' effort to obtain a decision about the suggested Tyneside airfield, the Newcastle Corporation has invited charter operators to organize services from the municipal airfield at Woolsington. This field is at present occupied by an R.A.F. maintenance unit, though the Newcastle Aero Club is making use of it.

At present the Ministry of Civil Aviation's interim provision for a north-east air terminal covers the use of Croft, some 35 miles from Newcastle, pending the construction of a new airfield on a central Tyneside site.

SELLING BRITISH AVIATION

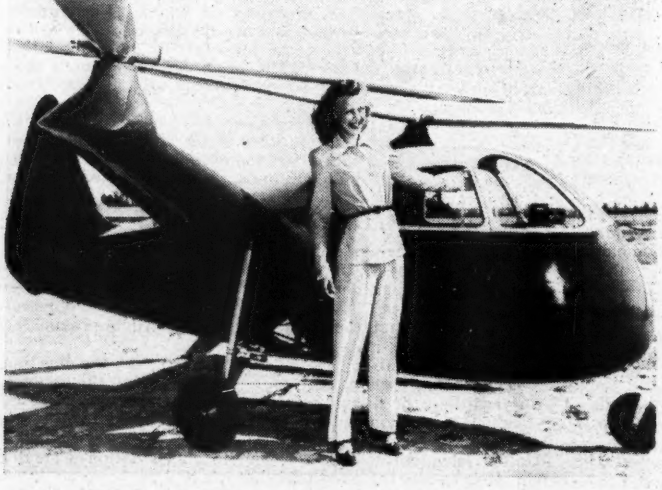
THE three Corporations will have a combined stand at the International Aeronautical Exhibition in Paris which opens on November 15th. The stand will include a pictorial presentation of the routes covered by the British Corporations and there will be a staff of traffic clerks and stewardesses to answer questions. The exhibition will be the first public occasion at which the B.E.A.C. girls will be seen in their new uniform.

SOARING FORECASTS

IN order that sailplane pilots may be able to calculate the "lapse" rates and, consequently, the height to which thermals may be expected to rise and the probable cloud distribution, arrangements have been made for the Dunstable weather broadcast station to give special information in the airmet programme. This addition to the programme has been made in response to a request from the research committee of the B.G.A., and particulars will be given of pressure, temperature and humidity at 50 millibar intervals up to the 500 millibar level, with any important inversions, and the maximum temperatures expected during the afternoon. The special forecasts will be given at 8.25 a.m. each day.

P.A.W.A. EXPANSION WITHIN U.S.

PAN AMERICAN WORLD AIRWAYS have submitted to the U.S. Civil Aeronautics Board an application for trans-Continental and other long nonstop routes within the United States to connect with the thirteen cities which the company is now authorized to serve on its overseas routes. The routes which are sought would permit P.A.W.A. to compete for a share of the traffic in a larger domestic field, and it is understood that fares on the Clippers—which would be Boeing Stratocruisers and eventually Republic Rainbows—would be lower than those now charged by the American domestic airline operators.



THE LANDGRAF HELICOPTER: The lady in the picture shows the small size of the machine, which has a Pobjoy engine. Flaps on the blades are used instead of cyclic pitch variation.

BREVITIES

Gatwick has been taken over by the Ministry of Civil Aviation and Mr J. A. Gordon, previously manager of Shoreham, has been appointed manager. Mr. L. W. Green has been appointed assistant airport manager for London Airport, in succession to Mr. G. D. Middleton, who has been made manager of Gander Airport, Newfoundland.

* * *

The Government of Greece is in the process of organizing its civil aviation policy and, at the moment, is concentrating on internal services. Aircraft on these services are Dakotas, but it is understood that there is every probability they will eventually be replaced by D.H. Doves and Bristol Wayfarers.

* * *

It is understood that the Consolidated Vultee Aircraft Corporation may be bought by the Lockheed Aircraft Corporation. Consolidated are at present at work on a 200-passenger version of the XB-36 for Pan American Airways.

* * *

The increase in air traffic from this country is indicated in a comparison of the number of passengers passing through Airways Terminal for one week in September this year and for a similar period last year. 4,448 passengers left and 4,227 passengers arrived during the week in 1946, and 762 passengers left and 936 arrived during the week in 1945. The number of services during that period were 636 in 1946 and 134 in 1945.

FROM THE FLYING CLUBS

ALTHOUGH the official opening of the clubhouse has been postponed until next spring, when full facilities will be available, the Wolverhampton Aero Club has been in active operation since March this year. Starting with a single Auster —which has now put in more than 400 hours' flying—the club has now, in addition, two ex-R.A.F. Magisters. Four initial "A" licences and fourteen renewals have so far been obtained.

* * *

The Gloucester Flying Club, whose headquarters are at Staverton airfield, have at last managed to obtain a Tiger Moth, which is now being overhauled for its C. of A. Until now the club members have had to be satisfied with ground instruction only. The Gloucester Club is holding its first anniversary dinner on October 9th at Mercer's Hall, Gloucester.

* * *

Since May 1st, when it re-opened, the Wiltshire Flying Club has been exceptionally busy and the instructional fleet now consists of seven Austers and one Magister. This club, incidentally, also provides instruction for the Royal Artillery Aero, the Royal Air Force Netheravon Flying and the Parachute Regiment Flying Clubs. Up to September 1st a total of forty-two "A" licences had been obtained, and the dual and solo flying for the period amounted to 1,267 hours. There are three instructors, led by Flt. Lt. K. W. Birt, D.F.C. and Bar, all of whom, interestingly enough, were C.A.G. pupils at High Post before the war.

* * *

The air display put up by Marshall's Flying School at Manea a fortnight ago was a very considerable success, especially as the village is a comparatively small one in the Fen District. Three of the school instructors, led by Mr. L. V. Worsdell, gave a flying display with Tiger Moths, and there was a long queue for short flights. On the previous day Marshalls' had collaborated with the R.A.F. to provide an "at home" at Cambridge. A Gloster Meteor and an Avro York provided by the R.A.F. were available for inspection.

* * *

The Aero Club of South Africa has requested the Johannesburg City Council to stage a King's Cup Air Race, with Johannesburg as the starting and finishing point. In order to attract international competition the club proposes that a prize of £5,000 should be offered. It is understood that Field Marshal Smuts has already been advised and was not averse to the proposals

Decca Demonstration

P.I.C.A.O. Delegates Make Air Trial : Automatic Standby Systems : World Plans Ready

REGULAR readers of this journal will be well aware of the efforts made by the Decca Navigator Company in striving to achieve an efficient, safe and comprehensive system of navigational aid, the developments made in the company's work in this field having been fully reported in these pages from time to time.

It must be appreciated that this is very much an interim period in air navigation. There exist many diverse systems, each with a tenable claim for international adoption, which it is the unenviable task of the various international commissions, particularly P.I.C.A.O., to weed-out until the best of all is found. Suffice for us to say at this point that, whilst each and every system advanced must necessarily be explored to the full, the Decca system would seem to offer unique advantages, not the least of which are its simplicity, reliability, and unrivalled accuracy.

Together with delegates of P.I.C.A.O., we recently had the opportunity to experience an actual flight demonstration of navigation by the Decca system, and a most convincing experience it was. We flew in a Bristol Wayfarer from Croydon to Shoreham, not a great distance, but sufficient to show the very efficient qualities of this new navigational system.

Charles Bovil, of the Decca Navigator Co., points out the "green" deccometer reading to P.I.C.A.O. delegates during the demonstration flight

The three deccometers, one each for the red, green and purple signal lanes, were mounted on the front bulkhead of the Wayfarer's cabin, and each passenger had a miniature chart on which the hyperbolic red and green lanes were overprinted; the purple lanes were not given since, in this region of the country, they are not necessary for accurate fixing. By reading the meters and finding the co-ordinates on the chart, position-fixing was child's play. The steady, unfluctuating progress of the needles made meter reading positive, without need for personal assessment, and when the chart told one that, at the intersection of red x with green y, an east-west railway vanished into a tunnel, one watched the readings coming up on the meters; then, at the appropriate moment, looked out of the window and, sure enough, the railway beneath the aircraft could be seen entering the tunnel. At 300 miles range, the fix given is accurate to 30 feet.

From Shoreham, we visited the company's slave transmitter station at East Hoathley, Nr. Lewes. This station is the "green" transmitter, the "red" station being at Stoke Holy Cross, Norfolk, the "purple" at Wormleighton, Warwickshire, and the master station at Buntingford, Herts.

Safety Measures

Transmission is continuous throughout the twenty-four hours, and as a very sensible (and essential) safety measure, the station embodies triplicated transmitters: one on duty, one at standby, and one on maintenance. The duty transmitter is powered by mains supply, and the standby transmitter powered by sets of diesel-electric generators *which are running the whole time.*

Should any fault develop in the duty transmitter the standby is automatically brought in to take over transmission. Changeover is made in less than a second, and a warning bell is automatically rung as an alarm. In this event the third transmitter is then brought to standby, the faulty transmitter put on maintenance and the trouble found and rectified. Similarly, should a power failure of mains supply occur, the diesel-electric generators on standby automatically fill the breach. Such a system is very reassuring indeed.

The Decca company have made plans for a world chain of stations. The whole project is virtually cut and dried so that, should the international planning authorities now investigating the air navigation position give the word, the whole scheme could be put into operation throughout the world without further delay. A consideration which should be given due weight in the assessment is that the same system is equally applicable to the world's shipping.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

SCALE MODEL AIRCRAFT

A Fully Detailed Example on Show

AS a reader of your magazine and an aircraft engineer of many years standing, I have recently noticed you have referred to model making to scale in your articles.

I have just constructed a model P-51D Mustang and have it fully detailed, such as pressed overload tanks, rocket racks and rockets, retracting undercart with scissor action alignment, sliding canopy, detailed cockpit interior, engine fully detailed to the extent of petrol flexes and airscrew hollow pressed spinner. The finish is polished cellulose, high gloss.

The model was recently exhibited at Chatham Town Hall, Kent, and was set as a scene depicting an overhaul with the engine out of the airframe. Although the model is not finally finished, I have been told that it will be worth at least £80 when completed, but I think it looks better as it is at present inasmuch as the parts are more easily seen. H. MARSDEN.

LORD TEDDER'S WARNING

An Auxiliary Squadron in Most Counties?

RECENTLY the Press has aired the concern felt by Air Ministry officials on the dwindling number of volunteers for regular service, it being stated that the ranks of our youngest Service have been so depleted that its ability to defend these isles might be impaired—should the need arise!

When last the need *did* arise, the regular R.A.F. was usefully augmented by a number of squadrons of the Auxiliary Air Force—the "week-end" airmen of N.A.A.F.I. disputes!

I was fortunate enough to have served for some two years with one of these units—the County of Kent—and although by that time the men of Kent and the Kentish men had been well diluted with V.R.s and war volunteers, there existed at all times a remarkable team spirit and high morale.

Peacetime finds no justification for the severing of hometies that war made so imperative, and so causes this melting of manpower in the Royal Air Force. Yet many regret, as I do, the inability to maintain skill and efficiency in a trade hard taught in years of conflict. But no means are at hand in the immediate locality of my home, Leicester, to practise the arts and crafts of aviation along Service lines, so it must atrophy.

Why is it not possible to establish an auxiliary squadron in most of the major counties, and let ex-R.A.F. personnel be doubly useful by maintaining the drive for exports and produce in the work-a-day week, and efficiency for more martial calls at the week-end?

It would be interesting to learn how long it would take to equip such a squadron from the surplus stocks on hand—and also how many! "474."

Things Regular Airmen Dislike

LORD TEDDER'S recent appeal for more volunteers for the regular Air Force raises the query: "Why have so many regulars chosen civvy street, rather than continue in the Service?" We have heard much of the good side of the life, so perhaps a look at some of the not-so-good might clear the air a little.

Many regular airmen, like myself, attained N.C.O. rank during the war, proved that they could perform their duties competently and, on that basis, received further promotion. As these were temporary promotions, the end of the war brought the matter of reduction to the forefront.

When the matter was broached to higher authorities, no answer was given, and that alone lost many trained men.

A further cause for disquiet was the list of officers who had been granted permanent commissions. It is important that officers shall inspire confidence and loyalty by knowing their jobs thoroughly, but the names of some of the officers in that list did nothing to encourage regulars, who knew them, to stay in.

The practice of placing an officer in charge of a section, with no knowledge of that particular trade, caused much dissension among N.C.O.s and airmen alike. In many cases these officers were young and inexperienced in the proper way to run those sections, yet they too often attempted to instruct N.C.O.s of many years' experience on how to run their sections. The result was often unhappy for the "erks," who were required to execute the contradictory flow of orders. A commission can never give a man technical knowledge or experience.

The system—if there was one—of selection for overseas service was chaotic. In theory every fit man should be sent in rotation for a "tour."

In practice too many did two tours and too many did none at all. All the regulars who re-engaged, whom I knew personally, were drafted to overseas commands as soon as their leave expired. Was this to encourage others to stay in?

It certainly made up my mind on the subject.

The following are suggestions to improve the lot of those who are still serving:—

1. No booking in or out of camp in the evenings, but the penalty for absence after 0800 hr to be severe.
2. A smaller number of officers, but with a higher standard of efficiency, particularly in the handling of men.
3. Separate messes for grounds staffs and aircrews.
4. Mess staffs, cooks, waitresses, etc., to be doubled. Theirs is hard, unenviable work.
5. Naafi to spend large sums from the profits on better canteens and food. Don't tell me they don't make profit, please!
6. Improvements in uniform, particularly the Waaf hats.

There is nothing in these suggestions that calls for large efforts from the Air Ministry, yet they would be very welcome to the boys and girls who have to "soldier on."

For myself, I say "PER ARDUA AD ASBESTOS."

NEW EFFICIENCY FACTOR

Cleanness Formulæ Suggested

MAY I suggest a cleanness factor for aircraft?

(1) For jet engines, including rockets:—

$$F = \frac{\text{weight of aircraft in lb}}{\text{engine thrust in lb}}$$

at a true air speed of 375 m.p.h. at 20,000ft in level flight.

This speed is chosen because here 1 h.p. = 1 lb thrust. The choice of altitude is purely arbitrary.

(2) For turbines or reciprocating engines driving airscrews:—

$$F = \frac{\text{weight of aircraft in lb}}{(\text{shaft h.p.} \times \text{airscrew efficiency as fraction of unity}) + \text{exhaust thrust.}}$$

When considering scale effect, wing area might be used as an alternative to weight. Wetted area or frontal area is less practicable.

Two obvious drawbacks occur. The information given would be useless when compressibility effects arise, and it fails to give a factor for aircraft incapable of 375 m.p.h.

If *Flight* could publish examples for a Spitfire IX, a Mosquito XVI and a Meteor IV, the results might prove most interesting.

H. A. LONG.

OVERDUE AWARDS

The "Moment of Glory" Disappears

THROUGH your excellent journal, I am prompted to write and express a feeling of growing disappointment (or is it bitterness?) that I am sure must be shared by a great number of ex-aircrew personnel, and by many still serving in the Royal Air Force.

In April, 1944, I was awarded the Distinguished Flying Cross for a successful tour on Bomber Command operational flying, the tour being completed in the December of 1943.

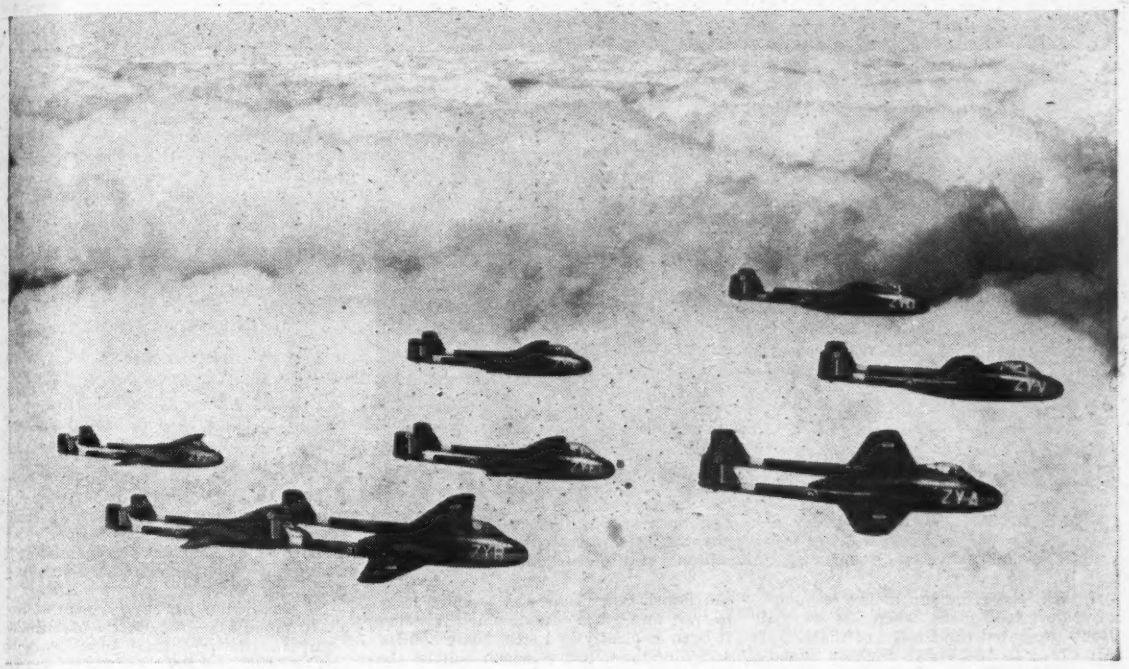
Until the end of the war, these awards were presented at personal investitures by His Majesty The King, and many must have looked forward to this event proudly, for themselves *and* for their parents, relatives or friends. Came the end of hostilities, and the inevitable cessation of these investitures, with many awards outstanding.

We were informed (through the Press) that the medals would be despatched via the G.P.O.! ! ! And since then there has been an absence of official statement; our "moment of glory" has apparently disappeared into a dusty file!

Whilst fully realizing that there must be a very large number of these awards to be dealt with, surely something could be done now to speed their delivery? Surely it is a "poor show" that this proud moment should be so neglected?

I still hope that there is yet time for the award, when it reaches me, to re-kindle in my parents eyes the justified light of happiness and pride that they expressed in those seemingly far off days, when Bomber Command enjoyed it's "finest hour," and when my own award was first gazetted.

R. CLARKE (Ex-Flt. Lt., Royal Air Force).



NECROMANTIC : De Havilland Vampire fighters with D.H. Goblin turbine jets, present a striking spectacle as they formate high above a cloud layer so characteristic of England in Summer.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

The R.U.S.I. Museum

THE wartime activities and equipment of the R.A.F. and Naval Aviation are now well represented in the Museum of the Royal United Services Institution in Whitehall. Supplementing models which depict the development of Service aircraft are representative guns, bombs and other items of Service equipment (a Mark XIVA bombsight is one of the latest acquisitions) with adequate annotations.

The Secretary of the R.U.S.I. would welcome any relics intimately associated with distinguished figures and notable events of the air war. He requests, due to demands on space, that these should be of small size.

The R.A.F. at Prague

HIGHLIGHTS of a Czech aviation rally at the civil airport of Prague during the week-end September 21st-22nd were R.A.F. events. Flt. Lt. Neville Duke took one of the practice Meteor IVs from the High-Speed Flight, and a Lincoln bomber carried fuel and ground crew to service his aircraft on the way and at Prague.

Air Vice-Marshal J. N. Boothman, Assistant Chief of Air Staff (Technical Requirements) flew out in his own Spitfire.

There were displays by three Czech Spitfire squadrons, the French Air Force did formation flying in Thunderbolts, and three U.S.A.A.F. P.80s were there, but had some trouble. A. B.29 was another American contribution.

After the Lincoln had given a splendid display, including, it is reported, flying with three airscrews feathered, Flt. Lt. Duke gave a superb exhibition of aerobatics which caused the crowd of about 600,000 to go almost wild with enthusiasm. He had to be "rescued" by the police from an admiring mob, and all the R.A.F. contingent were overwhelmed with praise, medals and gifts.

Appointment

THE AIR MINISTRY announces the following appointment: Air Vice-Marshal Alick Charles Stevens, C.B., to be Air Officer Commanding No. 22 Group, Technical Command.

Air Vice-Marshal Stevens has been A.O.C. No. 4 Group, Transport Command since December last, before which he was A.O.C. No. 47 Group from the previous August. In June, 1944, he was appointed A.O.C., Gibraltar, having previously been S.A.S.O. No. 18 Group (Coastal Command). From 1940 to 1943 he was Deputy Director of Naval Co-operation, Air Ministry.

He was commissioned in the R.N.V.R. in 1916, transferring to the R.N.A.S. in the following year and to the R.A.F. in 1918. After various courses in navigation from 1919 to 1922 he went to H.Q. Coastal Area for technical staff duties, remaining until 1925, when he was posted to Iraq for similar duties.

From 1927 to 1933 he was engaged on flying and air staff duties with various squadrons and in the latter year took a flying instructor's course at Gosport. In 1936 he was posted to the Far East to command No. 205 Squadron. Two years later he went to H.Q. No. 4 Group for air staff duties, and from September, 1939, to September, 1940, was in the Directorate of Operations, Air Ministry.

Air Vice-Marshal Stevens was born in 1898 at St. Helier, Jersey, and was educated at Jersey Modern School and Victoria College, Jersey. He was awarded the C.B. in 1944.

R.A.F. Association Reunion

THE captain of a Lancaster, flying at 2,000ft over the Albert Hall, opened the R.A.F. Association's Festival of Reunion at the Albert Hall on September 22nd. The show was sponsored by *The Daily Telegraph*.

Polish Squadron's Farewell

ON the occasion of the farewell fly-past by the Polish Fighter Squadrons in this country, attended by high-ranking British and Polish Air Force Officers, Air Marshal Sir James Robb, K.B.E., C.B., D.S.O., D.F.C., A.F.C., A.O.C.-in-C. R.A.F. Fighter Command, paid tribute to the achievements of Polish fighters in the war. The Polish Air Force accounted for 9 per cent of the air victories in the Battle of Britain, destroying 203 enemy aircraft.

At Coltishall, the base of the Polish Air Force Fighter Command, on Sa tem-

HOLE IN THE WALL: Loading a jeep on the Handley Page Hastings prototype. A model at the S.B.A.C. Display showed the Hastings with representative alternative loads, including an anti-tank gun and a light tank.

ber 18th, the ceremony of the exchange of colours took place, when Air Marshal Robb presented the Ensign of the Royal Air Force to the Polish Fighter Squadrons. In exchange, Group Capt. Bajan presented Air Marshal Robb with the Ensign of the Polish Air Force as a mark of deep friendship and comradeship in arms.

A message from Lord Tedder, Chief of Air Staff, read: "I cannot let this occasion pass without sending to you the good wishes of all the officers and men in the Royal Air Force with whom you have fought and have worked side by side throughout the grim years of war. . . . . Amongst your many successful engagements, the dates of September 7th and September 11th in the year 1940 will remain in our memories. . . . Now that the time has come to say farewell, I want you to know that you have won not only our admiration but our lasting affection."

Air Marshal Robb recounted the achievements of the Polish fighters in this country. He said that Poles took part in all the operations of Fighter Command, and added: "The spirit of the Polish Squadrons was a white flame in war, and peace cannot touch it. May it burn as clearly and steadfastly as ever and illumine a future which will be the brighter for its beams."

Air Vice-Marshal Izycki, K.C.B., Air Officer Commanding-in-Chief, Polish Air Force, pinned the Polish pilot's badge on the tunic of Air Marshal Robb as a token of personal friendship of the Polish Fighter personnel for their Leader.

In the fly-past which ended the celebrations, all the aircraft of 12 Group took part. The two squadrons of Meteors were followed by two wings of Mosquitoes, with 305 Polish Fighter Squadron taking the lead. Then came two Spitfires, flown from the Continent for this occasion, followed by three wings of Mustangs. The fly-past was closed by Nos. 309, 306 and 315 Polish Squadrons stationed at Coltishall.

Armament Officers' Convention

AN Armament Officers' Convention was held at the Empire Air Armament School, Manby (Commandant, Air Commodore H. D. Spreckley, O.B.E.) on September 10th and 11th. The object of the Convention was to bring together, at the Empire School, senior armament officers of the Royal Air Force and the Dominions Air Forces so that problems could be discussed, and officers brought up to date on what is going on in the United Kingdom. Some 60 visitors attended.

This Armament Convention is the first of its kind and if of value may be perpetuated annually, or possibly bi-annually.

Transport Command Appointment

THE appointment of Air Vice-Marshal Gerald Ernest Gibbs to Headquarters, R.A.F. Transport Command, as Senior Air Staff Officer, is announced by the Air Ministry.

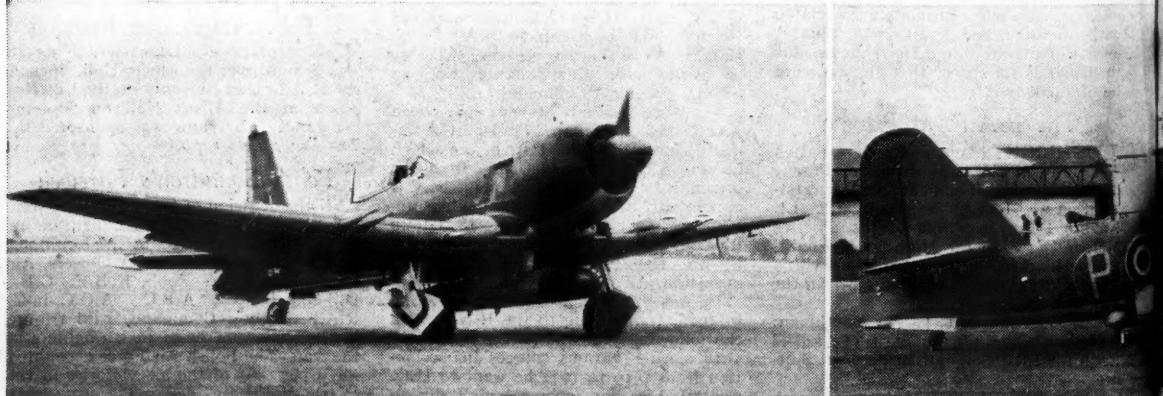
Air Vice-Marshal Gibbs has been Deputy Chief of Staff (Air) at Supreme Allied Headquarters, South-East Asia, since April, 1945, and was formerly, for a short time, Air Officer Commanding a Group in Air Command, South-East Asia.

He was Senior Air Staff Officer at No. 11 Group during the Battle of Britain, occupying the post from June, 1940, to the beginning of 1942.

B.A.F.O. Air Traffic Centre

THE function of an Air Traffic Centre is officially described as "the coordination of the control of aircraft flying in an airway"; but like most definitions, the virtue of this description lies in brevity rather than adequacy. The R.A.F. Air Traffic organization is complex and yet exceedingly flexible. Linked with similar organizations in the United Kingdom and in various parts of the Continent, the B.A.F.O. Air Traffic Centre is a semi-independent unit, and its main task is to ensure that aircraft fly under the safest possible conditions.

Much of the efficiency of the organization depends on the maintenance of a speedy and accurate information service. To this end the Air Traffic Centre keeps a record of all aircraft which pass, or are likely to pass, into its sphere of operations, so that at any given time the airfields of departure, routes, destina-



TORPEDO TRIO: An interesting comparison of the latest torpedo-dropping aircraft for Naval Aviation and the R.A.F. is afforded by these new *Flight* views of the Blackburn Firebrand T.F. Mark V, Fairey Spearfish T.D. Mark I and Bristol

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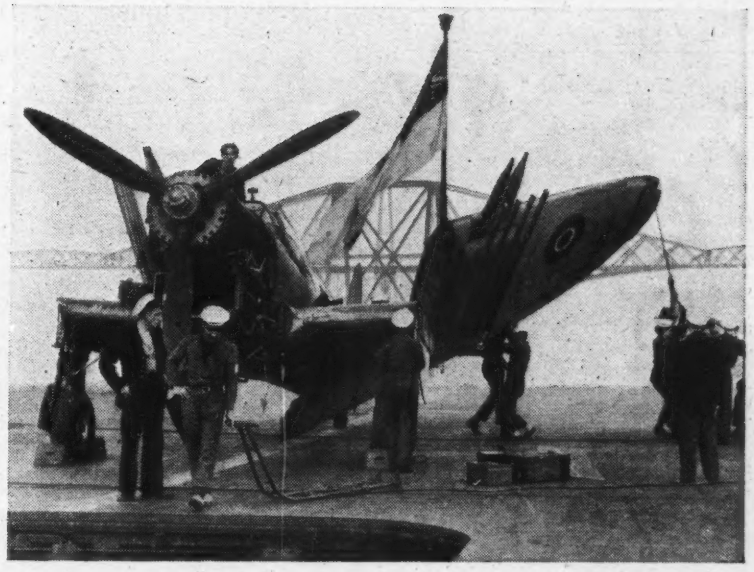
tions, and positions of these aircraft can be given on the spot. Much of the information comes from such outside sources as aircrews and the meteorological staffs, and the Centre is, in effect, a clearing house for all these reports.

One of the daily tasks of the Centre is the air conveyance of V.I.P.s to and from points all over the Continent. Since many of these journeys involve crossings of Allied and neutral countries, arrangements have to be made to warn the respective civil control centres, and in the case of flights beyond the Eastern border of the British Zone, to make sure that the aircraft use only the recognized air corridors. So many people are connected with the work of V.I.P.s that it is essential to cut down delays in their journeys to an absolute minimum to prevent wastage of time on the ground.

When, through bad weather or accidents, aircraft are unable to keep to their planned routes, alternative landing grounds have to be warned to receive them. Many former *Luftwaffe* stations would be suitable if they had the necessary maintenance staffs. Where a change of route is necessary, the Traffic Centre gives aircraft new instructions for landing. Where aircraft are missing the Rescue Services are directed and kept informed of all developments by the B.A.F.O. control organization, which keeps a W/T. watch on all aircraft in its area, and then sees that they are taken over by the next Control Centre.

This passing of aircraft from one "shepherd" to another is possible in Western and Southern Europe, but to the East there is no boundary of the B.A.F.O. Air Traffic Control area. This means that aircraft are controlled as far as Moscow, and even beyond, from Germany, making the land area covered by B.A.F.O. Air Traffic Control larger than that covered by any other Air Control organization.

Aircraft of all nations use the facilities offered by B.A.F.O., and within its sphere of influence the B.A.F.O. Air Traffic Centre is making a large-scale attempt to regularize procedure for landing and departing on airfields throughout the world.



FIREFLY IN THE FIRTH: The 32,000-ton Fleet carrier *Implacable*, launched by Queen Elizabeth and commissioned in 1944, has lately been on a visit to Scottish waters. Above, with the Forth Bridge as a backcloth, is a Fairey Firefly I, fitted with R/P rails, being prepared for flight.

New Rank Badges for Aircrew

THE KING has approved the designs for the new rank badges which will be worn by aircrew of the Royal Air Force below officer rank following the reorganization of aircrew into new categories. For the present the badges will be worn both with Service and working dress and will be embroidered in light blue silk on a Service blue background approximately 3½ inches wide and 2⅛ inches deep. Gold embroidered badges of similar design will be worn on a new and improved pattern of Service dress which is at present under consideration.

The new system of ranks for aircrew, which came into operation on July 1st, was described in the White Paper issued in December, 1945, setting forth the post-war code of pay, allowances and service pensions and gratuities for members of the forces below officer rank. This also sets out the new aircraft ranks which are as follows:—

Cadet Pilot, Cadet Navigator, Cadet Signaller, Cadet Engineer and Cadet Gunner (i.e., aircrew under training).

Pilot IV, Navigator IV, Signaller IV, Engineer IV, and Gunner IV.

Pilot III, Navigator III, Signaller III, Engineer III, and Gunner III.

Pilot II, Navigator II, Signaller II, Engineer II, and Gunner II.

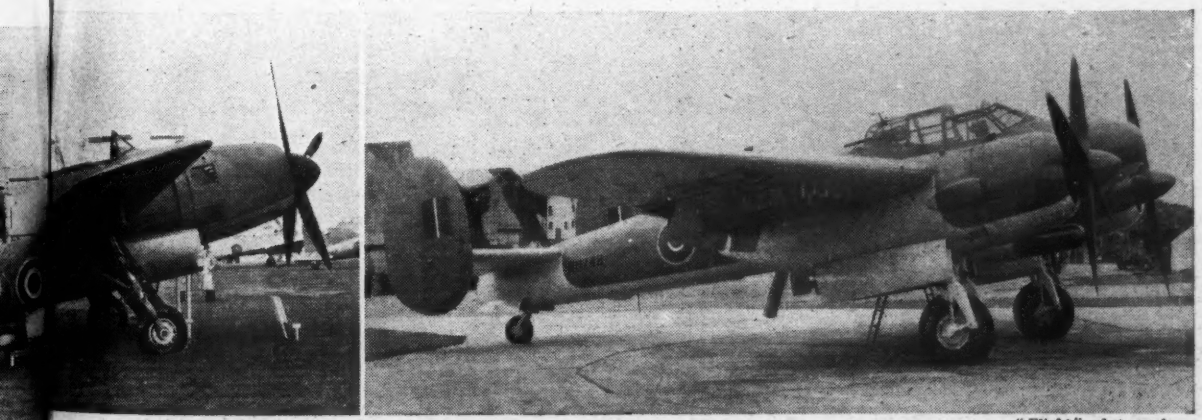
Pilot I, Navigator I, Signaller I, Engineer I, and Gunner I.

Master Pilot, Master Navigator, Master Signaller, Master Engineer and Master Gunner.

The basic design of the badges is the Royal Air Force eagle above a laurel wreath, the ranks being denoted as follows:—

Master aircrew, by the addition of the Royal Arms above the eagle.

Aircrew I, by three stars within the



"Flight" photographs.

Brigand T.F. Mark I. In all cases the power plant is the 18-cylinder Bristol Centaurus. The Firebrand is a single-seater: the Spearfish carries a crew of two, and the Brigand is a three-seater. Both Firebrand and Brigand have 4 × 20 mm. guns.

SERVICE AVIATION

laurel wreath, surmounted by the eagle and a crown.

Aircrew II, by three stars with the laurel wreath.

Aircrew III, by two stars within the laurel wreath.

Aircrew IV, by one star within the laurel wreath.

Aircrew Cadet, by the laurel wreath and eagle.

An additional note of colour is provided by the use of red silk in the Royal Arms worn by master aircrew and in the Crown worn by Aircrew I.

Master aircrew will wear their badges on the lower sleeves, in the same position as the warrant officer's badge is worn; the other badges will be worn on the upper sleeves in place of rank chevrons.

With the exception of pilots and navigators (all of whom are in Group A) aircrew are being divided temporarily into two groups, known as A and B, during the period of transition before it becomes possible to change over completely to the new categories. Generally speaking those in the Group B categories of signaller, engineer and gunner will have been trained to a lower degree of technical skill than those in Group A, and the difference in their grading will be shown by the stars in their rank badges, those from Group A being embroidered in blue and those for Group B in silver.

No aircrew category differences are indicated in the badges and these will continue to be shown as at present, by the pilot's wings and the single wings. The new badges were illustrated in *Flight* of September 19th.

New Zealand in 57 Hours

THE Avro Lincoln *Excalibur* (four Rolls-Royce Merlin) landed at Ohakea airport, near New Plymouth, New Zealand, on September 24th, only 57 hours after leaving England.

The Homs Accident

THE Air Ministry regrets to announce that the following casualties occurred in an accident to a Lancaster aircraft of R.A.F. Med. Mc. Command which crashed near Homs, Tripolitania, on September 19th, 1946:—

PASSENGERS.

MISSING, BELIEVED KILLED.
Wing Cdr. E. L. F. Meynell.
Flt. Lt. W. H. Davies.
Flt. Lt. G. R. Coleshill.
Flt. Lt. G. P. Jakins.
F/O. M. F. Long.
W/O. R. S. Shepherd.
W/O. G. T. Lee-Roberts.
W/O. F. W. J. Denyer.
W/O. D. J. Law.
W/O. B. F. Hillyer.
Flt. Sgt. J. H. Piper.
Flt. Sgt. C. J. Pearce.
Flt. Sgt. F. H. Butterworth.
Flt. Sgt. T. E. Lawson.
Flt. Sgt. K. S. Morris.
Sgt. M. S. Beames.
Sgt. R. H. J. Harris.

CREW.

MISSING, BELIEVED KILLED.
F/O. D. R. Faber.
W/O. D. J. Frost.
Flt. Sgt. J. H. Ashfield.
Flt. Sgt. P. H. Bond.
Flt. Sgt. A. A. G. Steele
Flt. Sgt. W. E. Bailey.
Flt. Sgt. L. J. Clarkin.
L.A/C. D. W. Maude.
Next of kin have been informed

Roll of Honour

Air Ministry Communiqué No. 604.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—W/O. C. H. Moore.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. M. Duncan; Sgt. C. P. Hutton; W/O. E. R. Watkins; W/O. R. P. West.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. S. S. Aarons; F/O. J. T. Adair, D.F.C.; W/O. A. Adams; Flt. Sgt. W. L. Allen; P/O. S. W. Andersen; Flt. Lt. J. N. T. Arkle; F/O. A. F. Biggs; Flt. Sgt. J. Blakey; F/O. L. Blick; Flt. Lt. K. H. Brailsford; Flt. Sgt. G. B. Breachmore; F/O. J. T. Bromfield; A/C.2 J. Brown; Flt. Lt. T. A. Brown; Flt. Sgt. D. W. E. Buckman; Sgt. H. J. Bye; Sgt. W. Cannon; Flt. Sgt. J. Chamberlain; W/O. G. E. Chaney; Flt. Sgt. K. H. Choak; Flt. Sgt. J. F. D. Churchill; Act. Flt. Lt. C. P. Clark; Sgt. N. D. Clayton; F/O. S. G. Crow; W/O. E. A. Daden; Flt. Sgt. N. Dennerly; F/O. W. K. Dovey; Sgt. R. M. T. Draper; W/O. M. J. Dunn; Flt. Sgt. B. J. Dye; F/O. J. F. Ellis; F/O. C. Entwistle; Sqn. Ldr. M. F. C. Farrar, D.F.C.; Flt. Sgt. A. H. E. Floyd; Flt. Sgt. P. Freeman; Sgt. J. C. Gibbs; Sgt. T. J. Goggin; Flt. Sgt. F. W. Gonsalves; Sgt. R. K. Grainger; P/O. E. J. Greenway; Sgt. G. B. Grenier; W/O. C. H. Griffith; Flt. Sgt. A. E. Grimsdell; Flt. Sgt. C. H. Hall; W/O. M. H. Harris; Flt. Lt. St. J. Hawkins; Sgt. L. W. Hazelwood; Flt. Sgt. W. A. Hedderly; Flt. Sgt. J. C. Hetherington; Flt. Sgt. T. Higginbotham; Flt. Sgt. R. D. Hilton; W/O. C. J. Holford; W/O. E. L. Holmes; Flt. Sgt. R. F. R. James; W/O. A. Jamie; F/O. H. J. A. Johnson; Flt. Sgt. D. A. Kelly; W/O. W. Lear; Flt. Sgt. R. J. Lewis; Flt. Lt. E. W. Lilley; Flt. Lt. R. C. Luck, D.F.C.; Flt. Sgt. J. D. McAree; Sgt. F. H. H. Marchant; F/O. H. Martin; F/O. E. D. Mason; F/O. G. F. Mertens; F/O. D. C. Moore; F/O. M. Morrison; Flt. Lt. T. L. Mumby, D.F.M.; Flt. Lt. K. J. Newman; P/O. R. E. H. Osborne; W/O. G. A. O'Toole; Flt. Sgt. A. Oxley; F/O. P. P. Parker; F/O. E. A. Penfold; W/O. K. C. Pickering; Flt. Sgt. A. R. Price; F/O. J. V. Prosser; Sgt. G. M. Pumphrey; Flt. Sgt. C. F. Purnell; Flt. Sgt. T. V. Raine; W/O. A. Ramsay; Flt. Sgt. J. L. Richardson; F/O. J. MacP. Ross; Flt. Sgt. W. Ross; F/O. E. M. Sissons; P/O. W. F. M. Skipworth; F/O. J. B. Smart; Sgt. W. W. Smith; Flt. Sgt. G. J. H. Snewing; F/O. R. H. T. Squire; W/O. A. J. L. Stewart; Flt. Sgt. J. Stewart; Act. Wing Cdr. S. G. Stilling, D.F.C.; W/O. J. R. Swain; Flt. Sgt. R. A. Towell; Flt. Sgt. E. W. Trail; Flt. Sgt. A. Turner; Sgt. H. J. F. Tutt; Flt. Lt. L. Unsworth; Sgt. E. T. G. Wallis; Flt. Lt. L. S. F. Watkinson; F/O. J. S. Watts; W/O. D. R. Whiskin; Sgt. F. Whitaker; Sgt. R. W. Whitehouse; F/O. S. T. Wilkins; F/O. J. E. M. Wilson; F/O. R. J. Wilson; Sgt. J. R. Wise; Sgt. J. D. Yole; Flt. Sgt. G. Young.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—F/O. G. A. J. Horton.

KILLED ON ACTIVE SERVICE.—Cpl. J. F. Allan; Flt. Lt. W. J. Baker; Flt. Sgt. C. C. Bryan; W/O. G. F. Burns; W/O. G. Cordon; F/O. R. B. Couchman; F/O. D. W. M. Crawshaw; W/O. K. J. Crouch; W/O. N. F. Dixon; Flt. Lt. E. A. Harding; F/O. K. W. E. Loman; A/C.2 W. E. Petch; Sgt. J. Robinson; W/O. P. C. B. Sharman; F/O. H. E. Simmonds; L.A/C. B. G. Swan; Cpl J. W. Thorpe.

MISSING BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. N. F. Baker; Cpl. E. E. Barker; A/C.1 W. A. Bingham; W/O. S. D. Birdsall; A/C.1 W. G. Crichton; Cpl. R. N. Davies; Act. Cpl. F. R. Emery; A/C.1 J. H. Evans; L.A/C. A. Fretwell; Sgt. K. A. Glynn; L.A/C. D. Lamont; Sgt. M. W. Lewis; Sgt. H. A. McBride; Cpl. G. W. Matthews; L.A/C. J. Milne; A.C.1 A. J. Munro; A/C.1 L. W. Owen; Cpl. S. Pyke; L.A/C. D. G. Russell; W/O. J. L. Simm; Flt. Sgt. W. Slee; L.A/C. G. Tweedie; L.A/C. R. Watkinson; Cpl. C. Wildman; Sgt. J. C. Williams; L.A/C. F. D. Wills; A/C.1 B. Wilson.

MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.2 J. Austin; L.A/C. W. T. Birch; A/C.1 J. W. Dodd; L.A/C. W. S. Douglas; L.A/C. J. Evans; A/C.1 G. L. Everett; A/C.2 W. M. Finlayson; A/C.1 C. W. Guy; A/C.1 J. Kinnair; A/C.1 H. E. Knight; L.A/C. E. Lewis; L.A/C. G. Lightowler; A/C.1 R. E. Lincoln; A/C.2 J. Looby; A/C.2 V. W. Lucas; A/C.2 J. A. McCarthy; A/C.2 T. J. Murray; A/C.2 J. R. Noble; A/C.1 S. K. Russell; A/C.1 A. Underwood; L.A/C. R. Whalley; A/C.1 W. L. Wilson; L.A/C. H. L. Yardley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. J. A. Botting; Flt. Lt. J. G. Birks; Flt. Sgt. L. T. M. Dowding; F/O. R. M. Leeming; W/O. S. Lyle; Flt Sgt. F. E. Morgan.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. W. Barwise; Flt. Sgt. W. H. S. Brash; P/O. A. W. Coventon; A/C.2 J. Duff; W/O. J. A. Edwards; Act. Flt. Lt. H. V. Ellison; Flt. Sgt. W. W. Hewitt; Sqn. Ldr. G. H. Jones, D.F.C.; Act. Wing Cdr. W. E. M. Lowry, D.F.C.; Sgt. K. R. Mulligan; Flt. Lt. F. O'Driscoll; F/O. A. Rhodes; Flt. Lt. B. H. S. Russell; Wing Cdr. A. E. Saunders, O.B.E.; L.A/C. F. Snowden; F/O. L. F. Soulsby; Flt Lt. J. Stenton; Flt. Lt. J. B. Stephen; F/O. R. J. Wilcock.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. Docherty.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Cpl. J. Hutchinson.

DIED ON ACTIVE SERVICE.—A/C.1 G. Abbotts; F/O. K. R. Archer; L.A/C. F. Ashworth; L.A/C. J. Bancroft; Cpl. N. G. Banks; A/C.2 P. R. R. Bendix; Sgt. E. Cartwright; Cpl. A. A. Clifton; W/O. F. R. Conner, D.F.M.; F/O. T. Davidson; L.A/C. P. A. Devaney; L.A/C. J. Duckworth; L.A/C. W. J. Fraser; L.A/C. H. S. K. Frew; Sgt. R. T. Frost; L.A/C. N. L. Hall; Sgt. Z. R. Hamilton; L.A/C. W. J. Hawker; L.A/C. R. A. Hill; Flt. Lt. E. A. Holbech, D.F.C.; Wing Cdr. W. R. John, O.B.E.; A/C.1 E. Johnson; A/C.2 D. W. Kennedy; L.A/C. G. S. Kibble; L.A/C. P. Moor; A/C.2 G. M. Natham; Sqn. Ldr. W. C. Newsome; L.A/C. H. Noble; A/C.2 L. J. C. Parke; L.A/C. R. E. Parker; Sgt. E. G. Penney; W/O. F. Roberts; L.A/C. F. G. Robinson; Cpl. R. A. Rose; Flt. Sgt. H. Smith; W/O. H. C. Smewton; W/O. W. J. C. Tilbury; L.A/C. H. S. Troth; F/O. V. Turner; Flt. Sgt. H. Urion; L.A/C. G. W. C. Wadmore; L.A/C. A. L. Weller; A/C.2 G. Whitehead; L.A/C. C. R. Williams; Cpl. A. G. F. Wilson; Flt. Lt. J. H. Wright.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE.—Flt. Sgt. E. Nesbit.

The badges of (Left) No. 84 Squadron, R.A.F. (Scorpiones pungunt (Scorpions sting); (Centre) No. 281 Squadron, R.A.F.—Volamus Servaturi (We Fly to Save); (Right) No. 547 Squadron, R.A.F.—Celer ad Caedendum (Swift to Strike).

Women's Auxiliary Air Force

KILLED ON ACTIVE SERVICE.—L.A/CW. D. Cowen.

DIED ON ACTIVE SERVICE.—Cpl. J. Napier.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. E. Barnard; Flt. Sgt. T. Bell; Flt. Sgt. K. T. Cook; Flt. Lt. C. R. H. Elmes; Flt. Sgt. H. B. Francis; F/O. G. H. Glasgow; Flt. Sgt. C. H. Hamilton; F/O. O. L. Loane; W/O. A. C. Mineeff; P/O. G. C. O. Pollie; Flt. Sgt. B. H. Smith; P/O. J. M. Tilbrook; P/O. W. Vaughan; W/O. A. R. Williams.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE.—Sqn. Ldr. E. W. Blenkinsop D.F.C.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. V. Arthur; Flt. Sgt. J. Baxter.

DIED ON ACTIVE SERVICE.—L.A/C. F. L. Schdroski

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. G. L. De Wall.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Lt. A. E. Dickson.

Royal Indian Air Force

KILLED ON ACTIVE SERVICE.—F/O. C. A. Hall; F/O. T. Miletich